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# POPULAR MECHANICS MAGAZINE

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See Page 173

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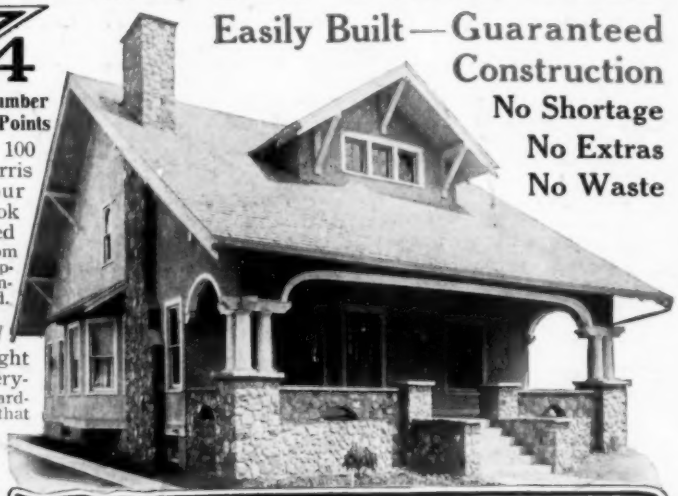

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# Popular Mechanics Magazine

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Vol. 24 AUGUST, 1915 No. 2


## Sidecars Carry Band in Night Cycle Parade

ONE of the interesting features of an unusual motorcycle demonstration recently held at Milwaukee, Wis., was the way in which a 25-piece brass band was carried along the streets of the city during its participation in a night parade. Each member of the band was seated in a sidecar, the leader preceding the players and directing them by using a baton fitted at the tip with a small incandescent light which could be clearly seen by all the musicians following.

The problem of illuminating the music held on the instruments of the various players was solved in a simple manner. A small-globed electric lamp, mounted in a reflector and connected with a storage battery carried under the seat, was provided in each sidecar. The lights were pinned to the caps, or coats, worn by the members of the band, while the wires connecting with them extended over the men's shoulders, so that they were entirely out of the way and did not interfere with the playing. This feature of the parade was sufficiently novel to attract much attention.

Six motorcycle policemen rode at the head of the parade, and at the rear there were industrial divisions made up of sidevans and three-wheeled trucks.

During a Night Parade of Motorcycles at Milwaukee Recently, a 25-Piece Brass Band was Carried in Sidecars. Individual Lights Illuminated the Players' Music, While an Electric-Lighted Baton was Used by the Director

## A NEW TYPE OF POCKET TELEPHONE

A new pocket telephone that has just been placed on the market is designed for the convenience of linemen, and others who find it desirable, in connection with their work, to communicate with headquarters from points between stations. The telephone set is housed in a case that is about the size of a pocket camera, the whole apparatus weighing only 2¾ lb. To use the telephone the cover is swung open to expose the transmitter and receiver, the cover in this position acting as a sounding board. Wires run from the instrument to a pole equipped with hooks with which connection is made with the telephone line. Current is supplied by a four-cell battery.

**Talking with Headquarters by Means of the Pocket Telephone: This Instrument is Easily Connected with the Telephone Line, and, When Closed, Is About the Size and Shape of a Pocket Camera**

## CRUISING RADIUS OF LATEST GERMAN SUBMARINES

When the German submarine "U-51" attacked and sank the British battleships "Majestic" and "Triumph" in the Dardanelles after making the voyage from Wilhelmshaven, Germany, to the scene of the encounter, a convincing demonstration was given of the efficiency of this class of fighting vessel. If the submarine followed the route around the north of Scotland—and it is not likely that it could have made its way through the closely patrolled English Channel—the distance traveled was between 4,000 and 5,000 miles, and so far as is known there were no bases along the route at which supplies could be renewed. This is close to the limit, 5,000 miles, heretofore accepted as the greatest possible cruising radius of the largest submarines. According to the conclusion reached by an English engineering journal, however, based on studies of the data given out by a German officer, the cruising radius of the latest and largest German submarines is practically limited by the endurance of the crew.

With an 800-ton submarine equipped with Diesel engines the oil consumption is estimated at about ten tons for each 1,000 miles. It is believed that there is storage capacity for 50 tons of oil, giving a cruising radius of 5,000 miles. This can be greatly increased by carrying oil in the water-ballast tanks. There is a limit, however, to the time that a crew can stay on board such a vessel. The quarters, especially at the beginning of a cruise when all available space is filled with stores, are seriously restricted, there is a continual oozing of oil from the bulkheads and doors throughout the ship, and the conditions as a whole are such as to tax the endurance of the crew.

# AIRMAN DROPS WREATH WHERE BEACHEY FELL

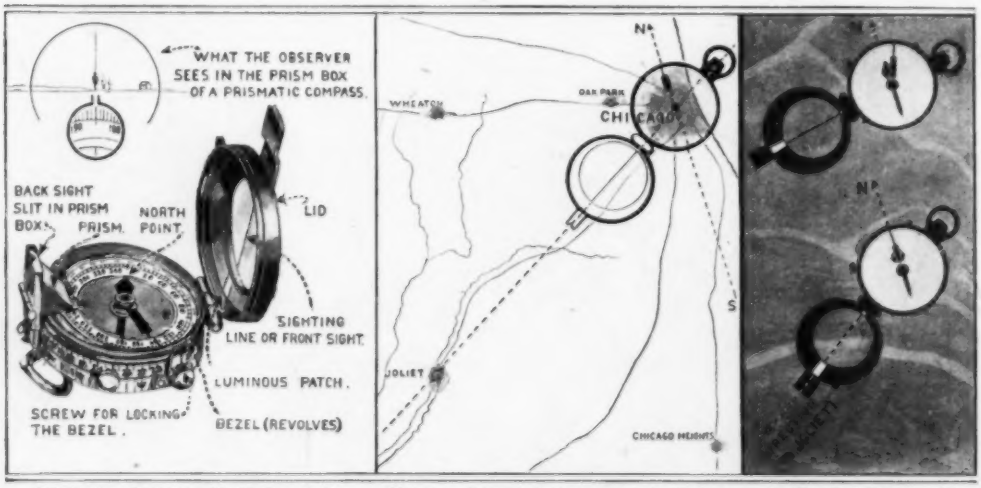
IN fitting tribute to the memory of Lincoln Beachey, who met death in San Francisco Bay some weeks ago, a young airman recently circled over the place where his colleague fell and tossed a wreath of roses and laurel to the water. The ribboned token dropped on the spot where Beachey passed from the view of his agonized spectators.

## PRISMATIC COMPASS FOR NIGHT MARCHING

Leading troops across country by compass bearing with as much certainty by night as by day is made possible through the use of a prismatic compass just brought out in England. The name given this compass is due to the prism fitted to one side of the frame, although this is not the most important feature of the instrument. The dial, which is made of mother-of-pearl, has a center coated with luminous paint, and in addition to this there are luminous patches on the lid by which the instrument is readily sighted at night. When a night march is to be undertaken the instrument is opened and exposed to the daylight for half an hour. This is sufficient to make the dial center and sighting patches luminous for from six to nine hours. In the latest form of the instrument this exposure to daylight is unnecessary, owing to the use of radium, a substance that is always self-luminous. The dial is graduated with two sets of figures, one set being designed for use with the prism. The hinged lid consists of a circular metal frame in which is a glass window, and across this window is an engraved sighting line. On the rotating glass cover that protects the dial is a black line called the index line. In taking a bearing the instrument is raised to the eye, the user looking through the slot over the prism and through the lid at the object sighted on, and reading at the same time the angle under the prism. By means of graduations on the side of the case the instrument can then be set and clamped so that when the index line is turned to the north point the instrument is on the bearing taken, there being no further need for reference to the figures on the dial. At night the lid is opened out horizontally and the sight is taken through the slot and over the luminous patches on the lid, the luminous dial center enabling the user to see when the compass needle and index line are at the right setting. When the instrument cannot be set by sighting, it is laid down and adjusted over a line drawn on a map.

## DOUBLE-END LOCOMOTIVES BUILT FOR FRANCE

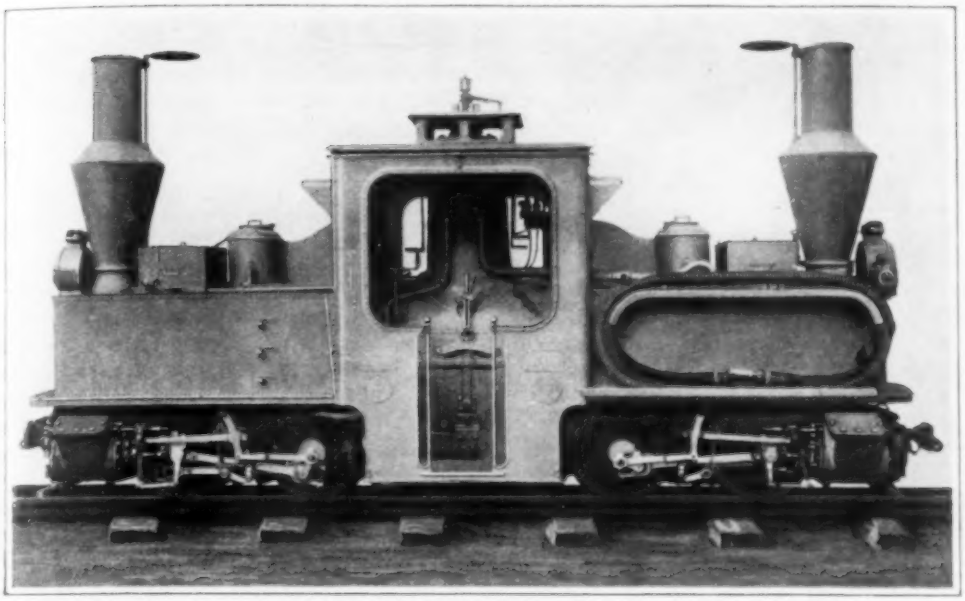
One hundred narrow-gauge locomotives of the Pechot type, each mounted on two bogies and provided with double-barreled boilers and two fire boxes, were recently made in America and shipped abroad for the use of the French government. Although these




With the Compass Held Level the Observer Places His Eye to the Slit and Sights through Line on Lid

When a Direct Sight cannot be Taken, the Compass is Adjusted to a Line Drawn on a Map

At Night, the Course is Found by Sighting over the Luminous Patches



One of the Curiously Designed, Double-Ended Locomotives Built in America for the French Government

engines are of a design entirely foreign and were constructed according to metric measurements, they were built and the last one shipped seven weeks after the order was received.

Because of its great flexibility, which allows its use on narrow, uneven tracks where sharp curves are frequent, this engine is being employed by the French, particularly in drawing its munition trains over hurriedly built lines leading to its war camps. The engine is not double-ended only in appearance, but is built much the same as if the rear parts of two small locomotives were joined. Each boiler barrel has a separate set of tubes and is supported on saddles placed immediately over the center pins of the bogies. An outside shell, between the two trucks, and supported on plate frames riveted to the saddles, carries the two fire boxes. The inside of these is made of copper, the tubes are of brass, and the boiler shell of steel.

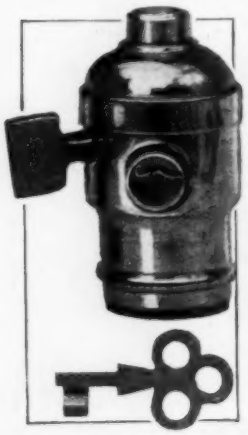
Water is carried in four separate tanks mounted beside the boiler barrels. The two of these placed on the fireman's side, however, are made shorter than the others to allow space for coal bunkers adjacent to the cab in the middle of the locomotive. Each fire box is independent of the other. When it is desired, the engine can be operated by a single bogie.

## ELECTRIC KODAK BUG USED FOR ADVERTISING

Desiring a novelty which would enliven his display windows and at the same time embody a certain significance, a Los Angeles dealer in photograph supplies ingeniously constructed what he terms a "kodak bug." It is made of electric bulbs of different sizes and is provided with highly colored wings of stained glass. The bug is perched in quite lifelike manner on the top of a camera in the middle of the window display, and is illuminated intermittently by a flasher. The device attracts the attention of many passers-by.

## SOCKET FOR ELECTRIC LAMP IS FITTED WITH LOCK

In order to prevent the theft of electric bulbs from lighting fixtures in public places, a socket has recently been introduced which is fitted with a lock, allowing a globe to be removed only by the aid of a key. When a bulb is locked in place and the key removed, it may be turned freely, since the screw shell swivels, but cannot be taken out. This offers a safeguard against injury to the lamp or its socket should an attempt be made to remove the former without a key. In many buildings and other places where electric lighting is employed the theft of globes presents a quite serious problem, which is responsible for the designing of locking sockets.



## FLOATING SUBMARINE DEPOT FOR BRAZILIAN NAVY

At Spezia, an Italian company is building a motor-propelled submarine tender for the Brazilian navy which will be one of the most thoroughly equipped ships of its kind ever constructed. It is to be 326 ft. in length, 51 ft. in beam, and will have a draft of 13 ft., while its two six-cylinder Diesel engines, which are to be of the two-cycle, single-acting type, will together be capable of developing 6,600 hp. Six submarines of less than 400 tons displacement will be carried by the parent ship. It will be provided with the necessary auxiliary equipage for charging the accumulators and air reservoirs of the underwater craft, and at sea will serve as a base for them.

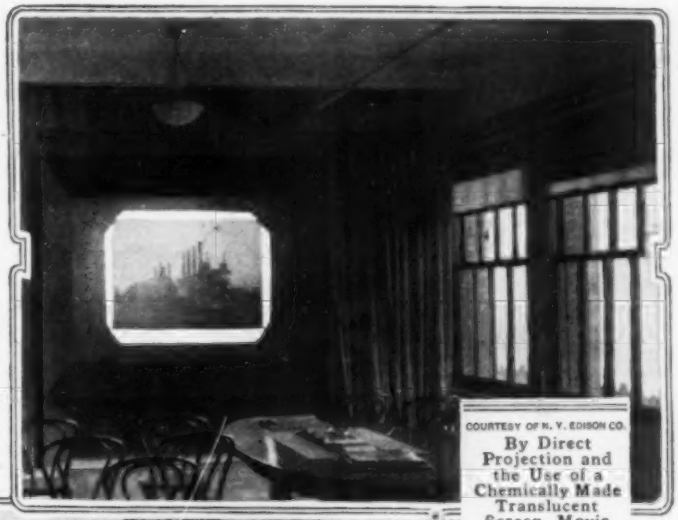
## NEW ACHIEVEMENTS IN THE MOVING-PICTURE FIELD

Two ingenious developments in the art of motion-picture projection have recently been made which may add somewhat to the spectators' pleasure as well as broaden the photoplay field. Each achievement, while in a manner related to the other, is different both in purpose and means of execution. One makes it possible to show a film in a sun-filled room, while the other enables pictures to be displayed in open air at night under the full glare of powerful electric lights.

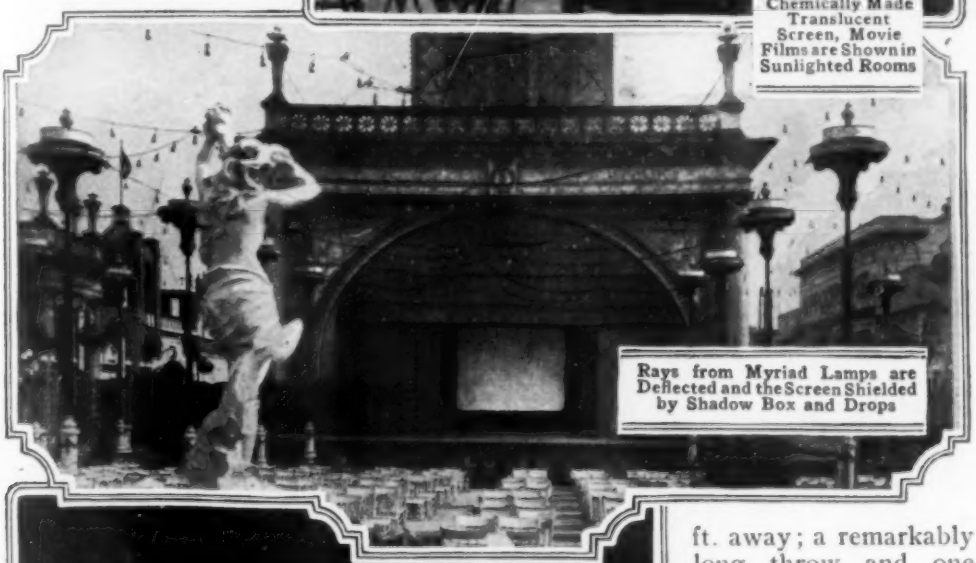
Daylight movies are a result of the invention of a translucent screen which allows a picture to be projected from the back of it instead of the front, as is customarily done. This of course makes it necessary to provide a dark room extending some distance to the rear of the screen in order that the light may be properly focused. The light thus reaches the audience by direct projection, not reflection. The screen consists of a gelatinous sheet, spongy in appearance like art gum, made of chemicals. It is said to be durable and capable of resisting heat and water. The chief difficulty in using this system is the necessity of providing extra space back of the screen, which in many theaters and pavilions is unavailable.

A plan has been worked out at one of the Chicago amusement parks which enables the film drama to be shown at night in the open without being interfered with by the powerful arcs and thousands of colored incandescent lamps illuminating the grounds. The light from these sources is shielded from the screen by means of a large shadow box which intercepts the rays and absorbs and deflects them, preventing their reaching the curtain. The screen, which is 20 ft. in width and 16 ft. high, stands approximately 25 ft. from the front of the stage. Extending diag-

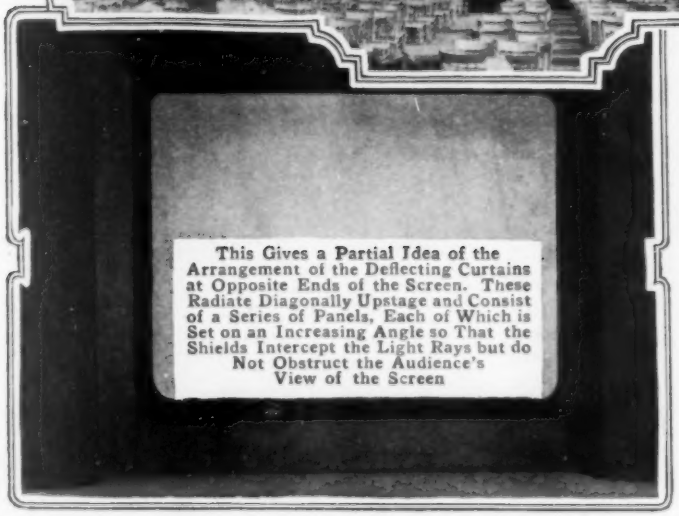
onally from each side of this and reaching probably 15 feet outwardly, are multi-angle shadow curtains made of black cloth fitted over a framework. A large number of black drop curtains are hung forward above the screen, while an incline extends out from it at the bottom. The projector is supplied with a special 10-in. lens, through which the light is focused on the screen 186 ft. away; a remarkably long throw and one known to be exceeded only in a single instance in this country, and in that case through darkness. All of the space between the lantern and the screen is roofed with colored lights, beneath which the "spot" has to be projected. On all sides the grounds are also brightly illuminated. The pictures presented are clear.



COURTESY OF N. Y. EDISON CO.
By Direct Projection and the Use of a Chemically Made Translucent Screen, Movie Films are Shown in Sunlighted Rooms



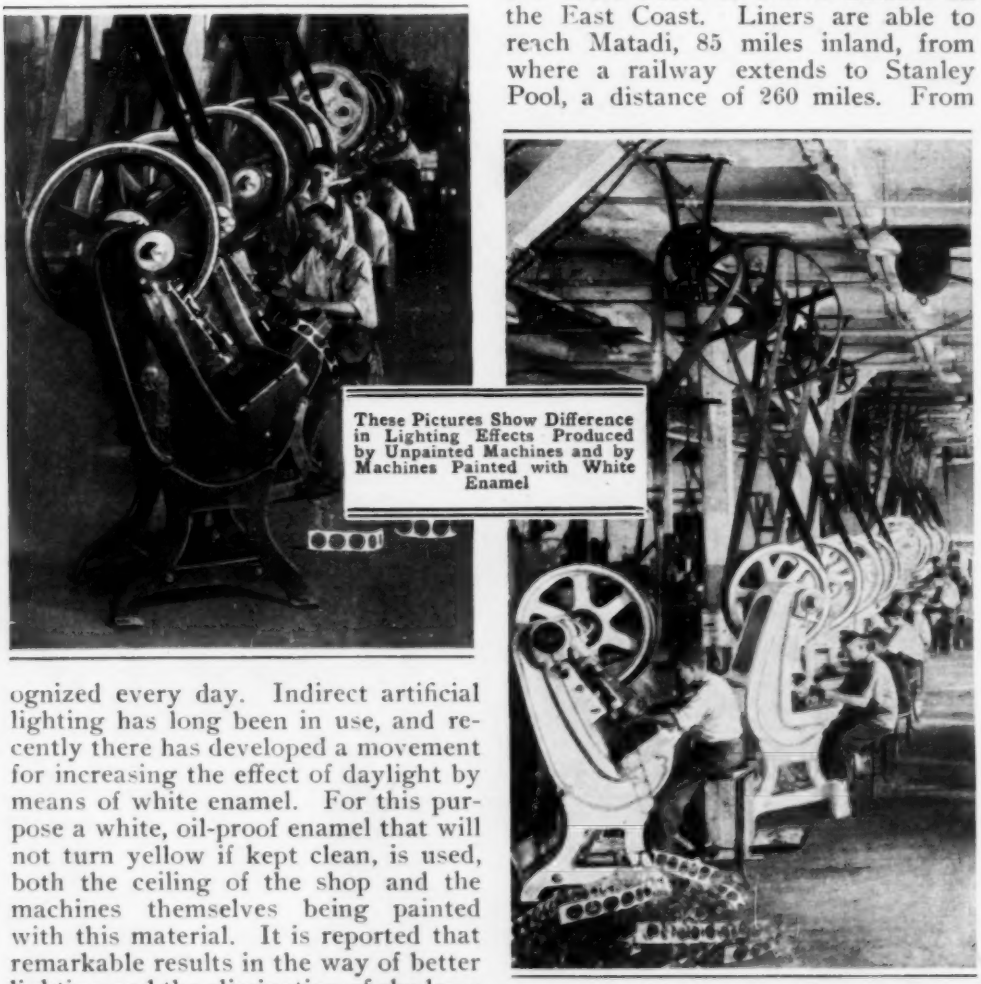
Rays from Myriad Lamps are Deflected and the Screen Shielded by Shadow Box and Drops



This Gives a Partial Idea of the Arrangement of the Deflecting Curtains at Opposite Ends of the Screen. These Radiate Diagonally Upstage and Consist of a Series of Panels, Each of Which is Set on an Increasing Angle so That the Shields Intercept the Light Rays but do Not Obstruct the Audience's View of the Screen

## PAINTING MACHINES WHITE TO AID IN LIGHTING

That good lighting in the workshop not only facilitates the work directly, but is of the greatest indirect value because of the feeling of security and cheerfulness given the workers, is a fact that is becoming more generally recognized every day. Indirect artificial lighting has long been in use, and recently there has developed a movement for increasing the effect of daylight by means of white enamel. For this purpose a white, oil-proof enamel that will not turn yellow if kept clean, is used, both the ceiling of the shop and the machines themselves being painted with this material. It is reported that remarkable results in the way of better lighting and the elimination of shadows are obtained in this way, these results being due to the fact that black absorbs the light while white reflects it with little loss. In making the accompanying illustrations seven times as long an exposure of the negative was required for the unpainted machines as for those that had been painted white.



These Pictures Show Difference in Lighting Effects Produced by Unpainted Machines and by Machines Painted with White Enamel

## TRANSPORTATION AFFORDED ACROSS CENTRAL AFRICA

With the final completion of the last link in the water-land route between the mouth of the Congo River and Lake Tanganyika, direct river and rail communication is now established across Central Africa from Banana on the West Coast to Dar-es-Salaam on the East Coast. Liners are able to reach Matadi, 85 miles inland, from where a railway extends to Stanley Pool, a distance of 260 miles. From that point the river is navigable for 1,000 miles. Wherever feasible, water transportation is used.

¶It is said that the only standard of size that is uniform all over the world is that of moving-picture films, which are universally made 1⅜ in. wide.

# NO "SMOKE OF BATTLE" IN MODERN WARFARE

ONE of the marked features of the European conflict that distinguishes it from the wars of the past is the absence of smoke on the firing lines. Owing to the use of smokeless powder, no smoke is made when a rifle is discharged, while the heaviest artillery throws off nothing more than a thin mist that is invisible a hundred yards away and disappears within a few seconds after the gun is fired. Only when shrapnel or a shell explodes in the enemy's lines is there anything visible in the way of smoke, the whole purpose being to conceal the position of the guns throwing the projectiles while making the points where the projectiles explode clearly visible. The expression, "the smoke of battle," so faithfully descriptive of the wars of the past, has little meaning when applied to a modern war.

The so-called smokeless powders used in modern guns are not entirely smokeless, but are sufficiently so for all practical purposes. When gunpowder explodes something like half of its substance takes the form of finely divided solids, and it is this that causes the dense smoke resulting from the explosion. Practically all of a modern propellant, and by this term is meant the smokeless powder used for propelling the projectile from the gun, is, on the contrary, converted into a true gas. In modern warfare every precaution is taken to keep the location of a battery hidden from the enemy, for artillery fire has become so accurate that when a position is once known there is little difficulty in raining shells on it. But the use of smokeless powder is not all that is required in many cases. Care must be taken to prevent the raising of dust by the blast of gas and air resulting from the discharge of the gun, and for this reason positions for batteries are chosen, when possible, on ground that is not of a dusty nature.

In addition to their smokeless feature the modern propellants have enormously greater power than gunpowder. In the days of the Civil War the distances between the opposing lines were seldom more than a mile, and it is said that the average distance was considerably less than this in the battle of Gettysburg. The effective range for modern artillery varies with the caliber of the gun, and ranges ordinarily from 2,000 to 12,000 or 15,000 yd. The 3-in. field gun used in the United States Army can be sighted up to 6,500 yd., or nearly four miles, while the new fieldpiece now being made is designed to have an effective range of 23 miles. In the European war most of the artillery engagements are fought at a range of more than four miles.

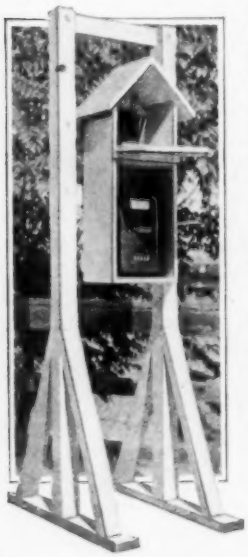
Since shrapnel is designed to burst in the air and rain its bullets on the troops at which it is aimed, it is necessary for the officer directing the fire to see just where the shells explode. For this reason the shrapnel shell contains, in addition to the high explosive, a smoke-producing charge that forms a matrix in which the shrapnel balls are imbedded. When the time fuse sets off the bursting charge in the base of the shell this matrix ignites and produces a ball of black smoke that serves as a marker easily visible to the officer directing the fire. In the case of shells that explode when they strike, no special arrangement of this kind is necessary, as the high explosives used in shells generate a black or colored smoke, depending on the explosive used, that provides a sufficient means for determining and maintaining the range. In this connection it is necessary to distinguish between the propellant used for firing the shell and the high explosive used in the shell itself. A propellant is designed to force the shell forward with gradually increasing velocity until it leaves the muzzle, without endangering the gun by excessive gas pressure. The charge in the shell, on the other hand, is designed to shatter and destroy by the generation of the greatest pressure in the shortest possible time.

The gases thrown out by a bursting projectile are often poisonous, but the possibility of injury from this cause is considered negligible except when the explosion takes place in an inclosure

that tends to confine the gases. No definite information as to the fatalities resulting from this cause are available, but there have been occasional dispatches from the battle fields of Europe telling of soldiers overcome or killed, apparently from the effects of the gases, following the explosion of a shell within a building.

## OUTDOOR HOUSING DESIGNED FOR ELECTRIC METER

For use in the irrigating districts of Oregon where many of the agriculturists employ electric energy for pumping purposes, a light and power company has designed an inexpensive outdoor housing for its meters. This consists of a wooden box divided into two parts, the upper of which incloses the switchboard and fuses, and the lower, the meter. A door gives immediate access to the switches and fuses, while a cover plate securely screwed in place over the second compartment protects the meter, which, however, is visible for reading. The box is supported on a substantial framework several feet from the ground.

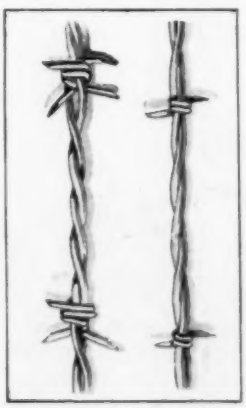


## ACROSS-COUNTRY CANOE TRIP PLANNED FOR SUMMER

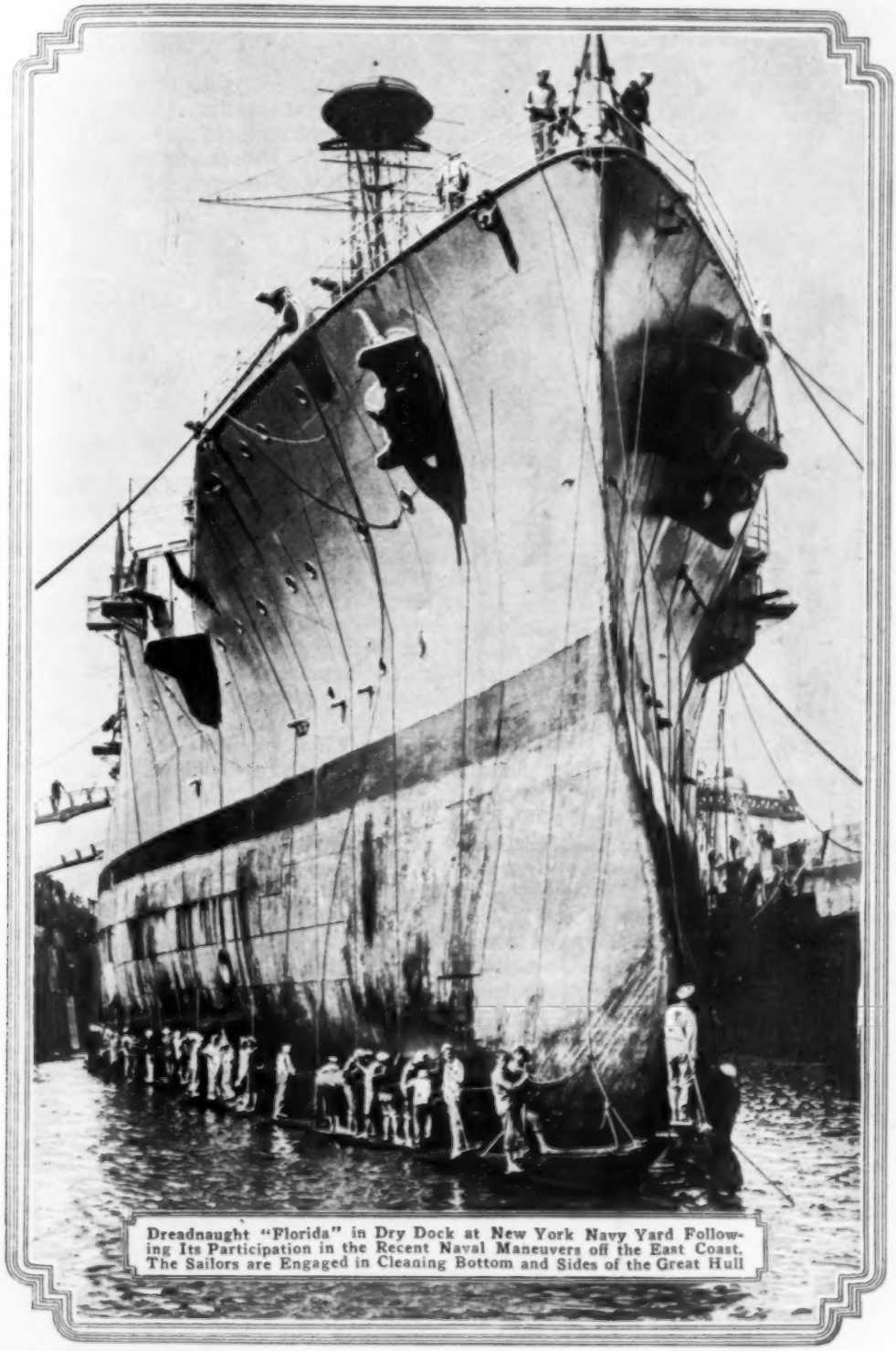
Two eastern sportsmen contemplate starting from Jersey City, N. J., for the Pacific coast on what is one of the most unusual canoe trips ever attempted in this country. The men expect to make their way across the continent by plying various rivers, lakes, and canals that will gradually lead them westward until they strike the Columbia River, down which they plan to paddle to the ocean. From Jersey City the route goes by way of canal to the Delaware River, thence to Delaware Bay and through Chesapeake Canal to the Potomac. It then extends up the latter stream to the Chesapeake and Ohio Canal, through that to Cumberland, Md., from where small rivers will be followed to near the headwaters of the Monongahela River, which leads the party to Pittsburgh, from where the Ohio River is followed to Cairo, Ill. From here they anticipate making their way against the current of the Mississippi to the Missouri, thence to the mouth of the North Platte and on to the Yellowstone and Snake rivers. Then by following intervening streams the route extends to the Columbia. A lightly rigged 18-ft. canoe equipped with a portable motor is to be used. The men expect to spend five months in making the trip.

## BARBED WIRE SENT ABROAD FOR USE OF ARMIES

Thousands of tons of barbed wire have been shipped abroad, since the outbreak of the European conflict, for the use of belligerent armies. For the most part this has been unlike that used domestically for fencing purposes, insomuch as it has been of a four-point type. The barbed wire ordinarily used in rural districts of America for land inclosures has two short-pointed barbs, approximately 1½ in. in length and spaced about 3 in. apart. That sent to Europe, to be used particularly in constructing barbed-wire entanglements, has four long-pointed barbs.



# OVERHAULING DREADNAUGHT AFTER SHAM BATTLE



Dreadnaught "Florida" in Dry Dock at New York Navy Yard Following Its Participation in the Recent Naval Maneuvers off the East Coast. The Sailors are Engaged in Cleaning Bottom and Sides of the Great Hull

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## COMPACT HAND TRAP MADE FOR "PIGEON" THROWING

For the use of the sportsman who enjoys target shooting, a compact hand trap for throwing clay pigeons has

The Trap Throws Clay Pigeons in Almost Any Manner Desired by the Gunner

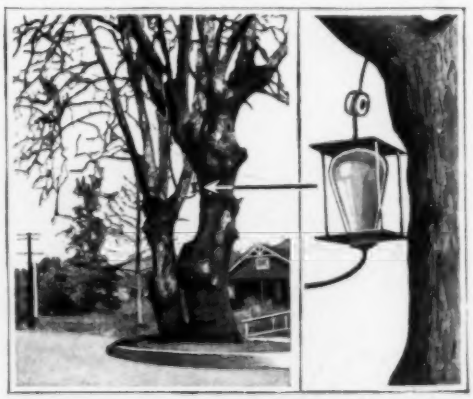
been brought out which is easily carried and provides endless opportunities for unusual trap shooting. It is built of metal and fitted with a heavy spring which actuates a lever arm, hurling the targets in various ways, providing "climbers," "skimmers," "jack rabbits," "twisters," or whatever is wanted. The weight of the device is 6¼ lb., while its size allows it to be carried in a suitcase, handbag, or special case, as is most convenient. With it trap shooting may be indulged in on camping junkets, or during motorboat or yachting trips. Shooting pigeons from a rapidly moving motorboat on choppy water is an unusually fast game which is made possible with the new trap.

## FISH KILLED BY SEVERE HAILSTORM

An almost complete extinction of the fish in several small streams was caused by a severe hailstorm that visited Texas recently. A succession of torrential rains had not only raised the streams to a flood stage but had made their waters so muddy that the fish were compelled to come to the surface in order to breathe. The rains were followed by a hailstorm during which the fish received the full impact of hailstones of enormous size, and after the storm had passed the streams were found to be littered with thousands of dead fish.

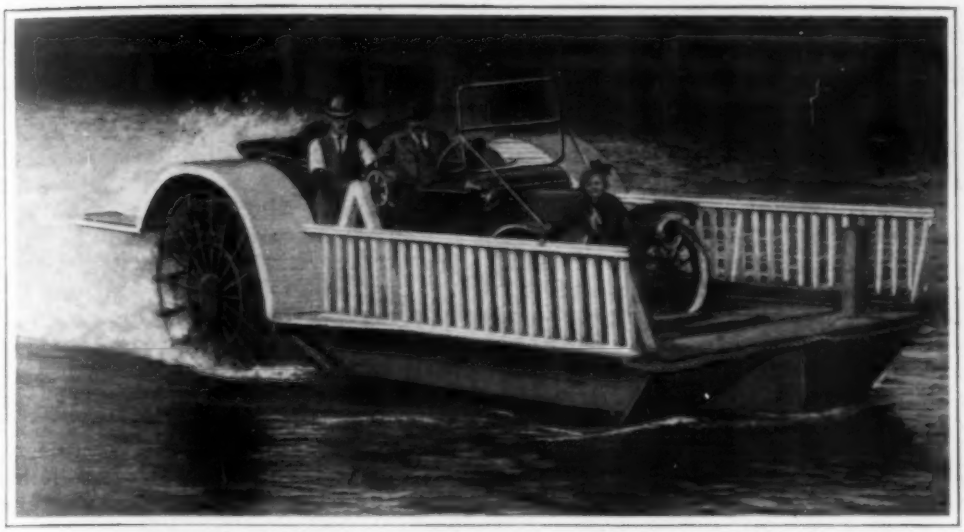
## TREE IN MIDDLE OF STREET HOLDS DANGER SIGNAL

Squarely in the middle of one of the principally traveled streets in a Los Angeles suburb is a beautiful old sycamore tree of unusual size. Because of its position much objection has been raised against it at different times and numerous attempts made to cause its removal. Adjacent property owners, however, have fought this vigorously, and in order to prevent accidents occurring at night, have had a parking built



To Prevent the Removal of This Tree, Property Owners Built a Curb about It and Erected a Danger Signal to Warn Night Drivers

about the tree and a red-colored electric lamp fixed to its trunk as a danger warning.



Automobile in Place for Driving Barge across a Bay on the Pacific Coast

## BARGE THAT IS PROPELLED BY AUTOMOBILE

For crossing a bay 20 miles wide connected at each end with a fine driving beach along the seashore, a motorist of Aberdeen, Wash., uses a barge built for less than $100 and so equipped that it can be driven by the automobile that it transports across the water. A propeller wheel, that is housed for safety, is located at each side of the barge near the stern. The axle of each wheel is at the right height to come in line with the rear car axle when the end of the car is raised a few inches above the deck of the barge, and is capped with a hardwood wheel, 18 in. in diameter and 2 in. thick. On each wheel are leather clamps for securing it to the spokes of the car wheel. With the rear of the car raised so that the wheels are clear of the deck and these wheels connected with the propellers by the straps, the barge is ready for operation by the engine of the automobile. The work of placing the car aboard the barge and making it ready for use requires about eight minutes. The barge can easily make eight miles an hour when propelled by a light car and considerably more than this with a high-power car.

## CONVENIENT COVER DEVISED FOR RUBBISH BOX

Receptacles for rubbish and waste paper, which were placed along the streets of Columbus, Ohio, some time ago were not provided with covers. The result was very unsatisfactory, for whenever the wind was high, loose papers were lifted out of the cans and swept along the thoroughfares. A top which is somewhat different from the ordinary style has been devised recently and fitted to some of the cans. This has both overcome the difficulty previously encountered and escaped the objection which had been voiced against the employment of closed covers or lids for the boxes. It is arched so that trash may be thrown into the can easily, while the content is protected from both rain and wind. It is hinged in place and may be tilted.

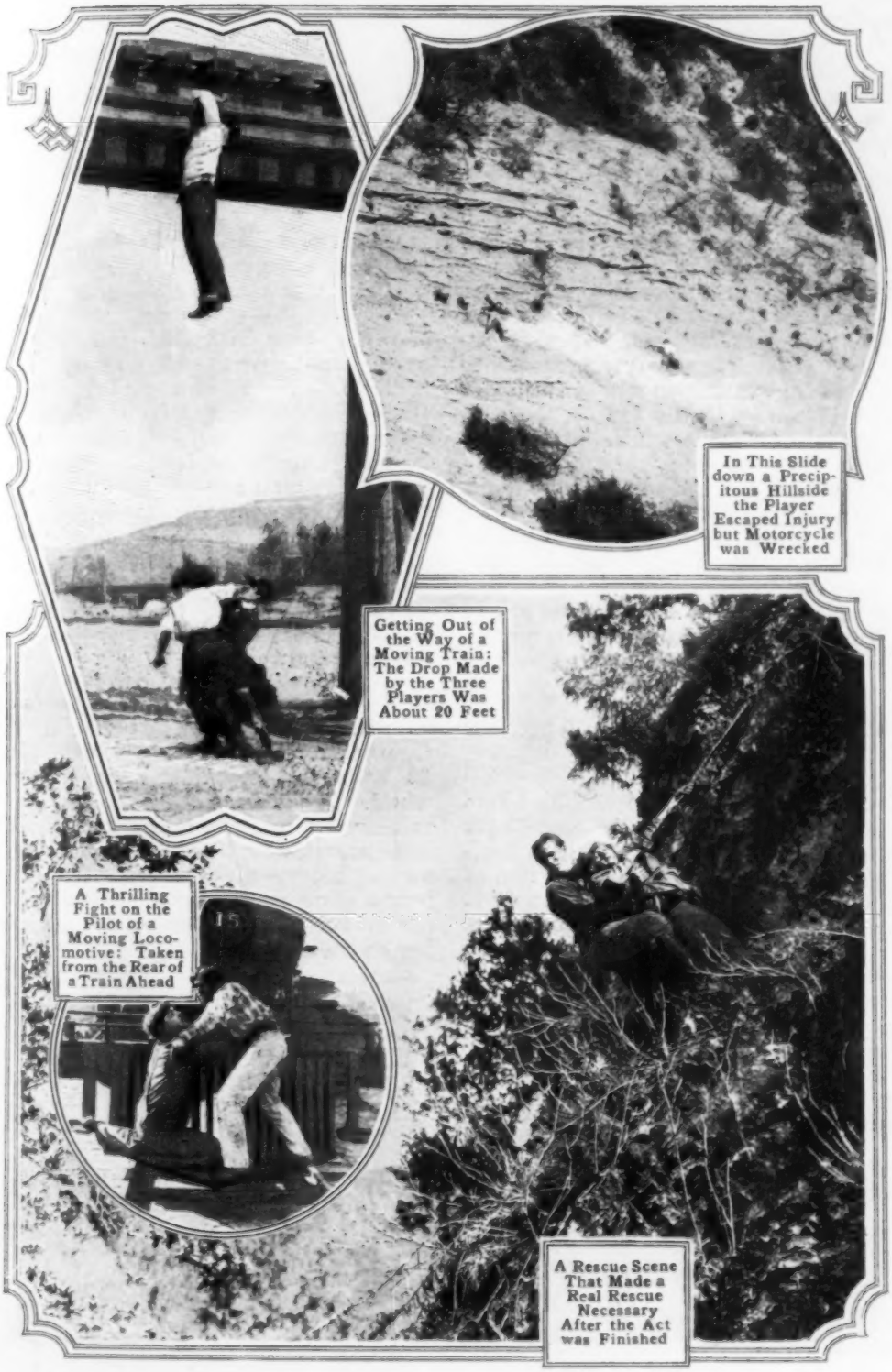
# TAKING CHANCES TO PUT THRILLS IN THE MOVIES

THAT motion pictures in the making often require the players to face real and serious danger, and even the possibility of sudden death, is a feature of the movies that few persons realize. The popular notion is that any act involving danger is "faked"—that in a fall, for instance, the actual fall is made by a dummy and not by a living player. This was true of motion-picture making in the past, and to a limited extent is true even at the present time. Some of the feats shown on the screen could never be performed by a living person without the certainty of death. But competition between the leading producers has become so keen and the taste of the public so exacting, that a thrilling act must as a rule be the perfection of realism, and this usually means that it must be the real thing. In meeting this requirement the players go to the limit of safety—and beyond.

One of the most daring of recent feats is a fall now being shown in one of the big plays. The actor is seen standing on a balcony 20 ft. above the ground. Suddenly he clutches at his breast as if shot and pitches backward off the balcony, turning over during the descent. This entire act is performed by a living actor who makes falling his business and who is said to have fallen a total of more than five miles in the past three years. In an act like this, the actual tumble would formerly have been made by a dummy, and the effect of continuity in the pictures would have been given by stopping and starting the camera at just the right instants as the dummy was substituted for the actor and as the actor took his position on the ground in place of the fallen dummy. Another act of a startling nature, shown in the illustrations, is that of a fugitive dropping from a signal bridge to the top of a moving locomotive. This feat was performed without injury to the actor while the locomotive was running at a speed of 17 miles an hour. The fight on the

In this Scene a Living Actor, Apparently Shot, Falls Headlong the Full Length of the Stairs

Dropping from a Signal Bridge to the Top of a Moving Locomotive



In This Slide down a Precipitous Hillside the Player Escaped Injury but Motorcycle was Wrecked

Getting Out of the Way of a Moving Train: The Drop Made by the Three Players Was About 20 Feet

A Thrilling Fight on the Pilot of a Moving Locomotive: Taken from the Rear of a Train Ahead

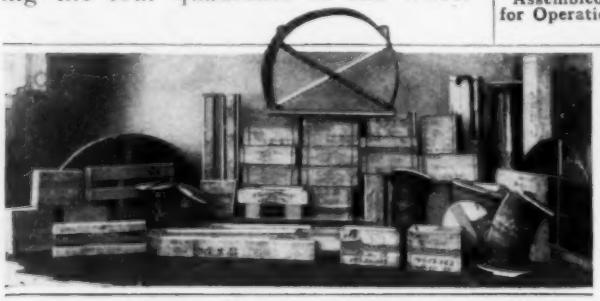
A Rescue Scene That Made a Real Rescue Necessary After the Act was Finished

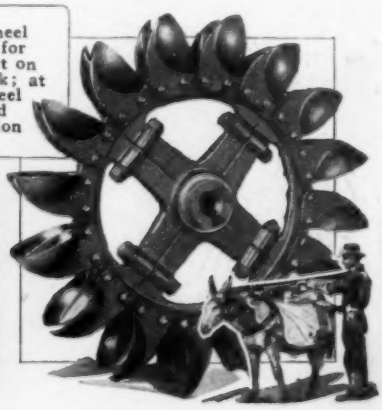
pilot of a locomotive was staged with the locomotive running at a speed of 20 miles an hour and the pictures were made from the rear of a train ahead. A single careless movement of either of the actors might easily have resulted in the death of one or both. The scene in which a man is shown letting himself and a rescued maiden down the face of a cliff by means of a rope was followed by a real rescue. The base of the cliff is fully exposed to the waves of the ocean and is considered one of the most dangerous points on the California coast. Just as the picture was finished the actor was struck by a wave and thrown violently against the cliff, and in his helpless condition would have been washed out to sea and drowned if aid had not been at hand.

The work of staging plays in which wild animals are used is always tense with the possibility of danger. Mistakes are sometimes made, and at best the player must get out of the way at just the right moment, with the margin between safety and danger narrowed down to a matter of seconds. In a jungle play recently produced the heroine was supposed to cross an open space a few seconds before a lion appeared. Through some mistake the lion was liberated too soon. In her fright the actress stumbled and fell. Just as the lion was about to attack, the trainer rushed to the scene and drove the enraged animal back with an iron rod, giving the actress time to reach a safety cage. In one film play three persons representing children are shown playing with a lion cub. Hearing a rustling in the leaves they drop the cub, run out of the picture and reach a hidden safety cage at the same instant that a furious lioness comes leaping through the reeds seeking her young. A moment's hesitation at the critical time would probably have meant the death of at least one of the players. These few instances are typical of the dangers the motion-picture players as a class are facing every day in order to satisfy the popular demand for thrill and realism.

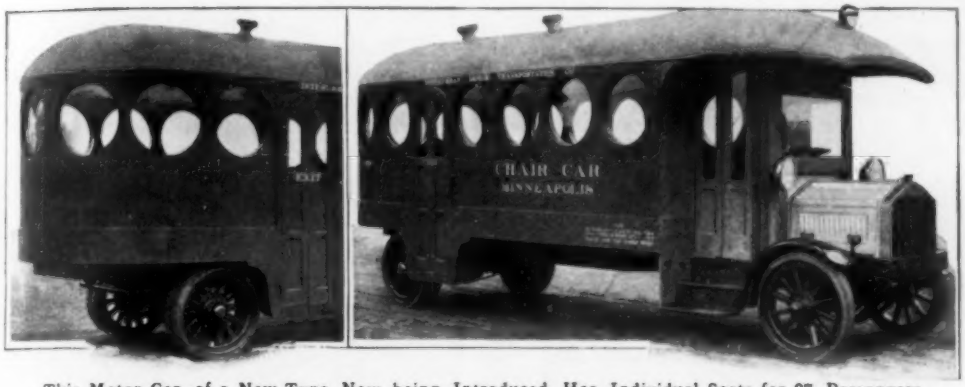
## WATER WHEEL TRANSPORTED ON MULE BACK

Getting a 100-hp. water wheel into the interior of Mexico on mule back was the problem presented to the managers of a mine located in a section of that country where there were no roads over which vehicles could be operated. In order to make this possible the wheel was built in sections so that it could be taken apart and transported across the mountains in pieces. The wheel was made in 56 parts, comprising the four quadrants of the wheel with the four bolts for fastening them together, and the 16 buckets with the 32 bolts for attaching them to the wheel. The nozzle with its controlling valve was also made in sections, these sections, with the bolts for assembling, making a total of 53 pieces. The different parts were packed in boxes of the proper size and weight for carrying on mule back.





The Wheel Packed for Transport on Mule Back; at Right, Wheel Assembled for Operation




This Motor Car, of a New Type Now being Introduced, Has Individual Seats for 27 Passengers and can Operate Anywhere That Fairly Good Roads Are Available

## NEW MOTOR VEHICLE FOR PASSENGER SERVICE

A number of novel features are embodied in a new passenger-carrying vehicle that has just been brought out and is designed to operate anywhere that fairly good roads are available. This vehicle is gasoline-driven, is a combination of motor truck and coach body, and is intended for city, suburban, or interurban service. The chassis consists of a 3½-ton truck with a wheel base of 23 ft. 10¾ in., while the body is built much like a Pullman car. Individual chairs, mounted on special springs for absorbing shock, are provided for 27 passengers. It is claimed that this arrangement, together with the springs on which the body is mounted, provides the maximum of comfort under road conditions that are far from good. Along the sides of the car are round windows, about 24 in. in diameter, which are hinged at the top and can be swung inward against the top of the car in pleasant weather. The car is electrically lighted and is provided with heating and ventilating facilities, the heat being supplied by the exhaust from the engine. The car is made to be operated on the prepayment plan. Entrance is through a door placed at the front end and at the right side adjacent to the driver, who acts as both motorman and conductor. The exit door is at the right side and near the rear, and both doors are under the control of the driver. For taking on or discharging passengers the car is driven up to the curb on the right-hand side of the street. Owing to the length of the chassis, the driving shaft is made in two sections with a bearing at the middle of the frame. The forward section connects with the transmission and with a short shaft supported in this bearing by means of universal joints, while the rear section is connected in like manner with the short shaft and the rear axle.

## ELECTRIC CLOCK DESIGNED FOR MOTOR CAR

One of the latest accessories to be developed for the motor car is an electric clock which winds of its own ac-

Electric Clock Built Particularly for Motor-Car Use

cord at intervals of three minutes. A balance wheel is used in the instrument instead of a pendulum. When the mechanism slackens its speed slightly, a contact is made which closes a cir-

cuit and energizes an electromagnet. This gives the clock sufficient force to run for three minutes, when the operation is repeated. A dry cell, or current from a storage battery, may be used.

## ELECTRIC MACHINE DEVISED FOR MANICURING WORK

Operating in much the same manner as a dentist's drill, an electric manicuring machine has recently been designed

This Electric Manicuring Machine Works in Much the Same Manner as a Dentist's Drill

by a Los Angeles woman. It consists essentially of a small motor to which is attached a flexible shafting, by which the various instruments are actuated. All the tools are made in disk form so that the trimming, cleaning, and polishing of the nails is done without the use of knives or scissors. While the apparatus is such as would be serviceable for the professional manicurist, because of the rapidity with which it does its work, it is also intended for personal use.

¶In the construction of an elevated structure in New York a pipe chute, which does away with the tossing of red-hot rivets, is used for conveying the rivets from the forge to the riveter.

## STEAM ROLLER IS EMPLOYED AS PAVEMENT CUTTER

In an attempt to lessen both the labor and time consumption ordinarily attending the removal of worn asphalt preparatory to resurfacing street pavement, an engineering company recently devised a cutting apparatus which proved quite efficient. Two pieces of 3-in. angle iron were curved to fit at the rear of a steam roller and sharpened so as to serve as cutting members. By driving the roller along the pavement, the irons pierced the asphalt and made sharp, clean cuts through the surface. In this specific instance a strip of pavement approximately 2,000 feet long and 8 feet wide was to be removed. By setting the irons to bracket the proper space, it was necessary only to drive the roller along the street to make the parallel cuts, which would have required several days of labor by a gang of men, had the work been done by hand.

## AWNING ARM MADE TO FOLD NEATLY WHEN RAISED

Intended particularly for use on ground-floor store windows, a jointed awning arm which folds back compactly, presenting a neat appearance when the canvas is raised, has recently been invented. When the awning is lowered the arm projects at right angles and is braced by a member which is pivoted to the bars. To hold the arm in its proper position, preventing sagging and also allowing the awning to lift slightly under a heavy wind pressure so that the canvas is relieved from unnecessary strain, a spring is secured to the bracket. This arm may be used with nearly any kind of awning.

Iron Cover Plate Blown from a Sewer Manhole through an Adjacent House: The Barrel Marks the Position of the Sewer Vent, While the Dotted Line Indicates the Course Taken by the Heavy Cap

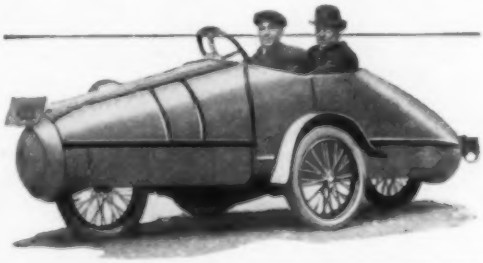
In the course of its fall it curiously enough tore away the foot of a bedstead in a chamber on the top floor, veered, crashed through the flooring and repeated the performance on another bed faced in the opposite direction in a first-floor room. Both beds were occupied at the time, but no one was injured.

## STRANGE SEWER EXPLOSION CAUSED BY FLOOD

Following heavy rains which caused a sudden rise of water in a sewer under construction at St. Louis, a very puzzling explosion occurred which hurled a 76-lb. cover plate of a manhole through an adjacent building. The iron cap sealed an air shaft 50 ft. distant from the house which was struck by it. It is assumed that sewer gas was compressed by the rising water, but whether this was exploded through ignition or not, is subject to conjecture. What happened otherwise, however, was that the cover plate was thrown entirely over a two-story house, striking a second building and passing through it to the first floor.

## CURIOUS-LOOKING RUNABOUT BUILT FOR CITY STREETS

Constructed with a chassis shaped like a rhomboid, a new motor car of an unusual type has made its appearance in the streets of New York. The

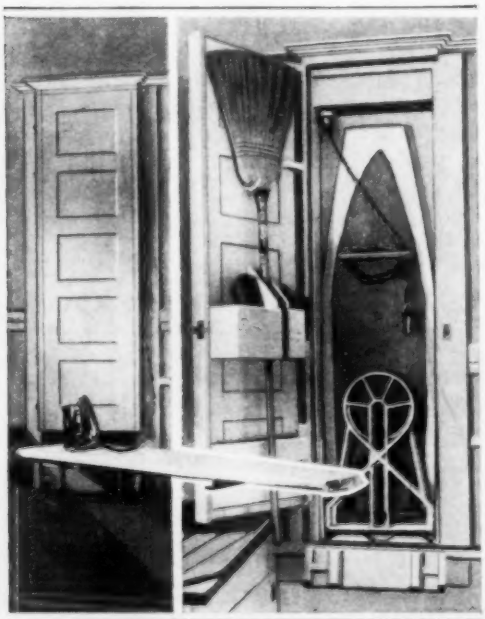


Odd-Appearing Car Which can be Turned Completely Around in Its Own Length

machine is designed particularly to meet the difficulties encountered in navigating narrow thoroughfares where traffic is congested and turning room reduced to the minimum. It is capable of making a complete turn in its own length, and this feature is the excuse given for its introduction. The wheels are placed at the four points of the rhomboid, the steering being done on the front and rear wheels, while the driving power is applied to the two side wheels. Although the present lines of the car are not appealing, particularly from the standpoint of beauty, the capabilities of the machine appear to have merit.

## NEW IRONING BOARD FOLDS INTO CLOSET

A telescoping ironing board that fits into a recessed closet and is easily let down to position for use has recently been invented and is soon to be placed on the market. When folded into the closet the board is concealed by a door. When it is to be used the board is let down to a horizontal position at right angles to the wall and is then pulled out until it stops. It can then be swung horizontally to any desired position. The board is permanently mounted on a pivoted support, placed within the closet, which is so arranged that it holds the board firmly without the necessity for a leg or other support at the outer end.



At Left, Telescoping Ironing Board is Shown in Position for Use; at Right, It is Shown Folded into Closet

## GROWING IMPORTANCE OF MOTOR-CAR INDUSTRY

An idea of the importance that the motor-car industry has assumed in this country is given in statistics recently issued for 1914. In that year there were 1,666,984 pleasure cars and 44,355 motor trucks, or a total of 1,711,339 motor vehicles, in operation in the United States. These vehicles paid more than $12,000,000 for the privilege of using the roads. In addition to this, owners and chauffeurs paid a total of $427,179 for the right to drive, while manufacturers paid an additional $21,255 for the privilege of running cars necessary to their business.

## SAVING MOUNT VERNON SITE FROM DESTRUCTION

The high bluff on which stands Mount Vernon, the home of our first president, has for years been in danger of gradually sliding into the Potomac. This danger became acute a few years ago when it was discovered that a new landslide was beginning that threatened to destroy the broad lawn in front of the mansion, if not the foundations of the mansion itself, and engineering work, recently completed, was begun at that time to save the historic site from further damage. The ground slopes from the mansion to the edge of the bluff and from this point drops steeply for a hundred feet or more, to the edge of the Potomac. The river at this point is a wide tidal estuary and the action of the waves has caused a steady erosion at the foot of the bluff. Underlying the bluff are strata of sand, clay, and soft sandstone, which, on investigation, were found to be saturated with

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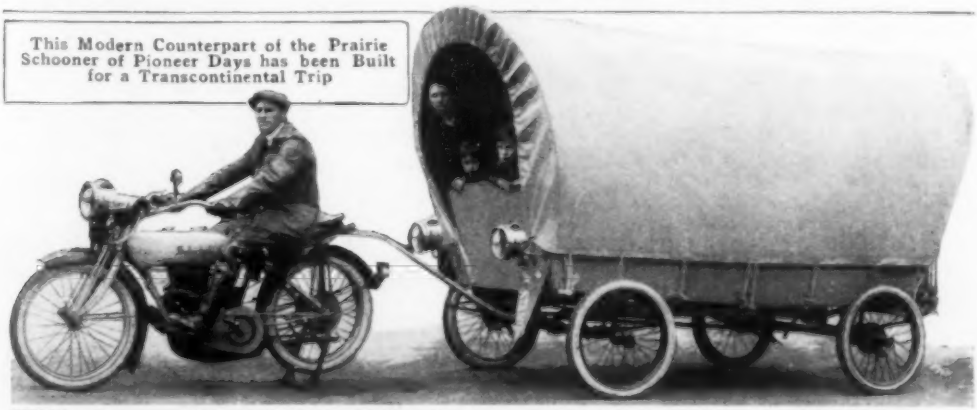
**The Mansion and Lawn at Mount Vernon: The Gradual Destruction of This Historic Site has been Stopped by Engineering Work Recently Completed**

water, and this, combined with the erosion of the waves, has resulted in landslides that have doubtless been going on intermittently for ages. To cure the trouble a small drainage tunnel was first driven in the bottom of the sandstone stratum and carried back from the river front a distance of about 200 feet. From this tunnel a heavy flow of water immediately started and this flow continued for several months. At the end of that time the flow diminished to a moderate amount and has remained practically constant ever since. To prevent further erosion at the foot of the bluff through the action of the waves a heavy masonry wall was then built along the edge of the river. It is hoped that danger of future slides has been eliminated.

## MODERN PRAIRIE SCHOONER BUILT FOR LONG TRIP

In preparing to make an overland trip from Stamford, Conn., to San Francisco, a motorcycle enthusiast has developed a truly modern prairie schooner which is no less an innovation than it is a curiosity. It consists of a light, covered wagon mounted on cycle wheels and drawn by a single-cylinder motorcycle hitched, horse-fashion, before it. The interior of the trailer is comfortably appointed with folding beds and specially designed cabinets for provisions, cooking utensils, and other paraphernalia. The builder of the vehicle will be accompanied on the journey across country by his wife and two children.



**This Modern Counterpart of the Prairie Schooner of Pioneer Days has been Built for a Transcontinental Trip**

# HOW SEWAGE IS PURIFIED BY BACTERIA

ONE of the best examples of modern methods and equipment for sewage purification is the plant recently built for treating the sewage at Atlanta, Ga., where the first Imhoff septic tanks ever installed in this country are in service. Septic tanks of this type, though a comparatively recent invention, are already in common use in the Ems River valley, and other sections of Germany, and are said to have proved the best means yet discovered for the first stage in the bacterial treatment of sewage. The Imhoff tank is simply a modification of the ordinary septic tank, which is itself an enlarged and improved cesspool. As in the case of the cesspool the process of treating sewage by this method depends on the action of bacteria, but in the septic tank this action is carried out rapidly and on a large scale.

The raw sewage enters the Imhoff tank through a series of inlets spaced across the end. It then flows slowly through the tank, and the liquid is finally discharged through outlets at the opposite end which lead to the filtering beds. The first bacterial action on the sewage takes place during its passage through this tank. There is nothing done to bring this about or to assist it, the action being a natural one exactly like the decomposition that takes place in a cesspool. Much of the solid matter contained in the sewage is decomposed before it sinks and is transformed into a liquid, but the heavier parts settle through a slot into a compartment below known as the sludge-digestion chamber. The process does not end with this. The deposit of sludge is being constantly decomposed and transformed into a liquid by the bacteria, so that the accumulation of sludge is so slow that the chamber can ordinarily go for months without being cleaned out.

The bacteria that do the work in the septic tank are called anaerobic, a term used to designate bacteria that do not require oxygen for their growth. One of the features about the Imhoff tank is that the gases produced in the decomposition of the sludge do not pass up through the tank itself, but are led up the sides to vents. How this is done is shown in the diagram illustrating a typical arrangement for Imhoff tanks.

When the liquid leaves the septic tank it flows to the filter beds, where the last stage in purification takes place. In the Atlanta plant, the liquid is sprayed over the bed by sprinklers, a method that causes an even distribution in the right quantities. Here the liquid is attacked by bacteria of another class, known as aerobic, or those that require oxygen for their growth. Practically, the process is one of aeration, and to assure a sufficient supply of oxygen, the air is conducted into the filter beds through a series of small ventilating funnels which revolve easily on their vertical axes, and are equipped with wind vanes so that they will always face the wind. Every speck of filtering material is covered with bacteria which attack the liquefied sewage and transform it into a harmless liquid. Tests show that when the liquid is finally discharged from the filtering beds at Atlanta it is 98 per cent pure.

When the sludge is to be removed from the sludge-digestion chamber, it is simply forced out through a pipe by the hydrostatic pressure of the liquid in the tank. It is a semiliquid substance that flows readily on a steep grade, and it is transferred to the sludge-drying beds by gravity, or by means of pumps, depending on the relative elevation of the septic tank and the drying beds. Here the sludge spreads out in a thin layer and is left to drain and dry. During this process the bacteria keep up their work, and by the time the sludge is sufficiently dried to be spaded into wagons and hauled away, it has been transformed into an unobnoxious and harmless substance which is valuable as a fertilizer.

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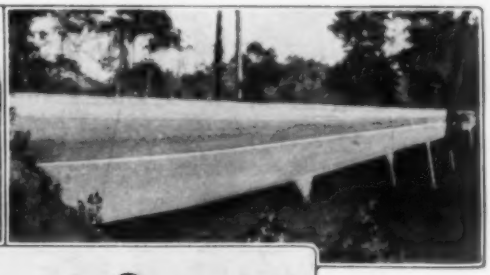
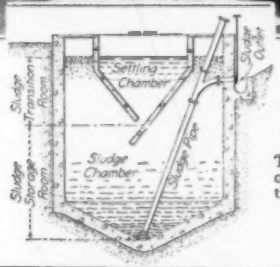
¶ Exportation of olive oil has been prohibited by Spain and Italy, but through the U. S. State Department special arrangements have been made for its shipment to this country, providing the importers give bond against its subsequent disposal in foreign markets.



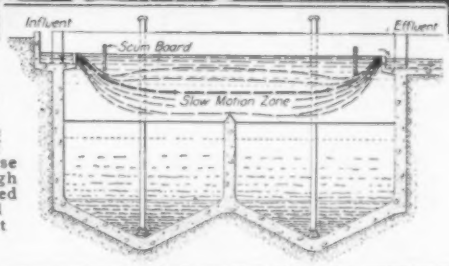
In the Pictures Above Two Views are Given of the Concrete Aqueduct, 275 Feet Long, That Forms Part of the Sewage-Disposal System at Atlanta, Ga.

At Left, the Filter Beds in Operation: The Liquefied Sewage is Sprayed over the Beds, under Which Air is Introduced by the Ventilating Funnels

A General View of the Imhoff Septic Tanks is Given Below. After being Treated in These Tanks the Sewage Goes to the Filter Beds for Final Purification



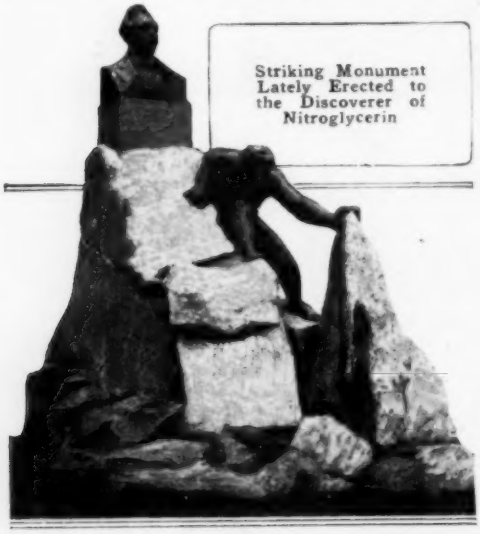

The Transverse Section at the Left Shows a Typical Arrangement of the Parts of an Imhoff Tank, While the Course of the Sewage through the Tank is Indicated in the Longitudinal Section at the Right



As the Sludge is Taken from the Septic Tanks It is Pumped or Conveyed by Gravity to the Drying Beds, Where It is Allowed to Drain and Dry before being Removed. There is Practically No Odor from These Beds

## MONUMENT TO DISCOVERER OF NITROGLYCERIN

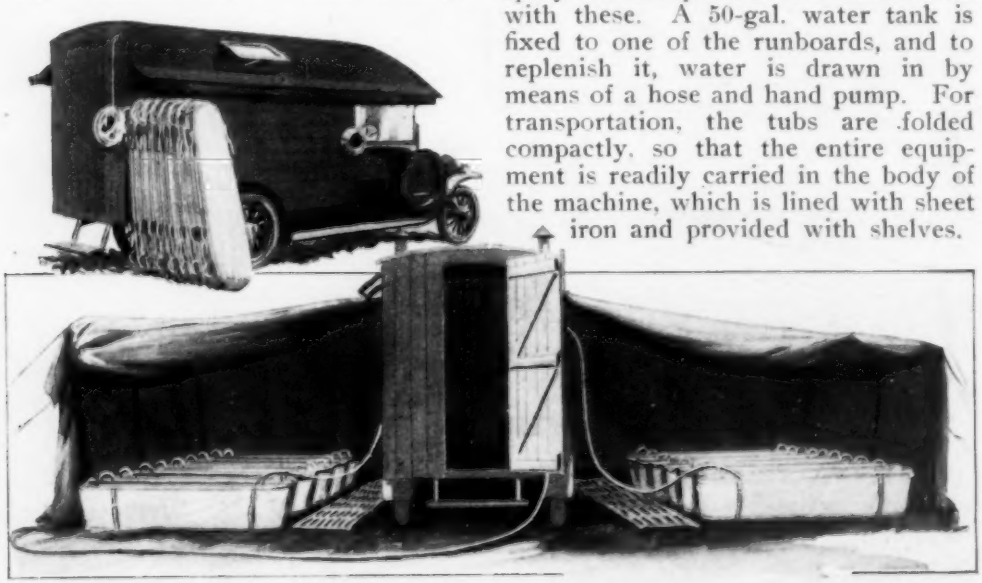
At Turin, Italy, a monument has been erected in memory of Ascanio Sobrero, who in the course of laboratory work in 1846 obtained nitroglycerin for the first time. The work is particularly of interest because of the simple, forceful way in which its sculptor has depicted the outstanding accomplishment of the Italian to whom it is raised. A bust of Sobrero surmounts a rugged pile of rocks. At one side and below the bust is a figure of a Hercules, personifying the explosive, braced as if exerting his superhuman strength to break apart the rocks with one mighty move.



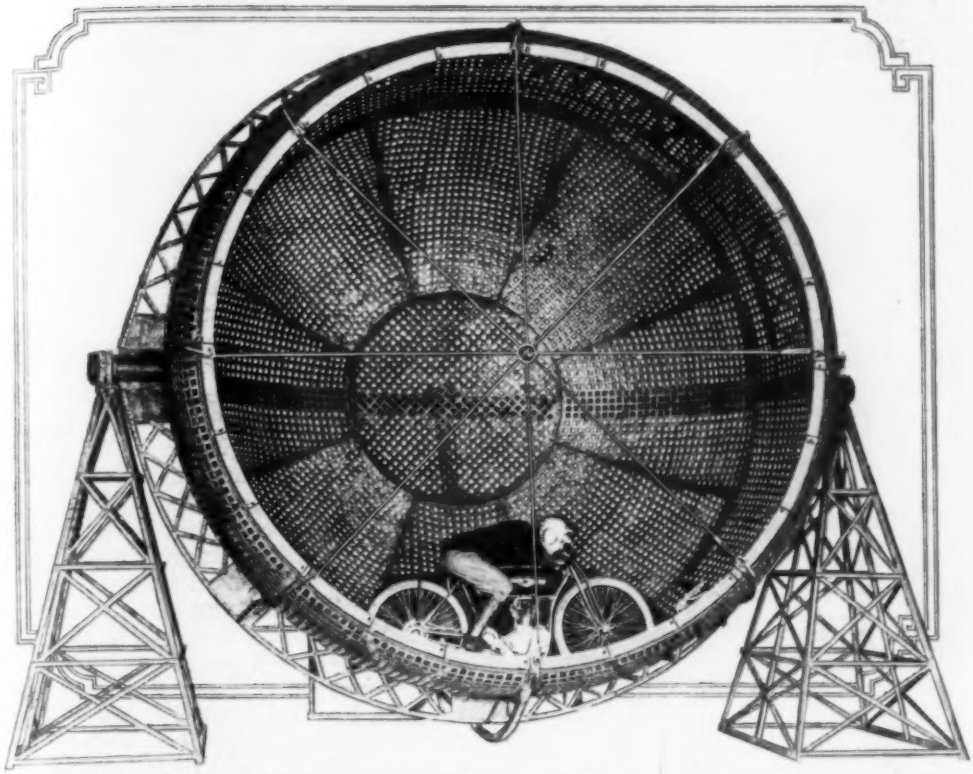
Striking Monument Lately Erected to the Discoverer of Nitroglycerin

## MOTOR-CAR BATHING OUTFIT DESIGNED FOR ARMY USE

Another use of the motor car in war has been found by a British company which is now manufacturing portable bathing equipments for the British soldiers at the front. The motor bath car carries 12 folding tubs made of specially prepared canvas and provided with substantial iron frames which hold their form rigidly when extended. When in use, these are placed in rows on each side of the car and covered by a tent made by drawing out canvas pieces fixed to the top of the machine, and securing them to tent poles. Two boilers, each of which heats approximately two gallons of water a minute, are mounted in the car. Paraffin sprayed under pressure is the fuel used with these. A 50-gal. water tank is fixed to one of the runboards, and to replenish it, water is drawn in by means of a hose and hand pump. For transportation, the tubs are folded compactly, so that the entire equipment is readily carried in the body of the machine, which is lined with sheet iron and provided with shelves.



Motor Bath Car Developed in Great Britain for the Use of English Soldiers Fighting at the Front. Above, the Tubs are Shown Folded in Readiness to be Placed in the Machine for Transportation



New "Bowl of Death" Which Turns from a Horizontal to a Vertical Position and Back Again as the Rider Drives His Motorcycle at High Speed around the Rim

## A NEW AMUSEMENT-PARK THRILLER

The latest thriller for amusement parks and similar institutions is a so-called "bowl of death" which turns from a horizontal to a vertical position and then back again as the rider drives his motorcycle at high speed around the rim. The bowl is made up of segments of perforated steel, is 15 ft. in diameter, and is hemispherical in shape except for a flat section at the center and a sharp inward curve at the rim designed to furnish the rider some degree of protection against the danger of running off the edge. When the motorcyclist begins his ride the bowl is horizontal, with the open side up. As soon as the machine attains sufficient speed to ride on the vertical edge the bowl is slowly swung to a position in which the open side is vertical. Following this the rider loops the loop one or more times. To end the ride it is necessary for the bowl to be swung back to its original position, when the rider slowly cuts down the speed until the machine is brought to a stop at the center. The bowl is carried on bearings supported on small towers as shown. The turning device consists of a pinion mounted on a tower at the rear and meshing with a rack on the back of the bowl.

## WEATHER-REPORT SERVICE TO BE EXTENDED

Because of the interest of such information to the public at large as well as its practical value in many lines of manufacturing, daily reports made by the U. S. Weather Bureau will in future include the humidity at 2 p. m. At present, observations are made only at 8 o'clock in the morning and 8 o'clock in the evening.

## STEREOSCOPIC PHOTOGRAPHS MADE IN NEW MANNER

After a great many failures in attempts to make stereoscopic views which would not necessitate the use of

This Illustration Gives an Idea of How the New Stereoscopic View Looks When Held at the Proper Distance from the Eyes

sphero-prismatic lenses for transmitting the double images to the eyes of an observer, a German scientist has developed a distinctly new process which apparently accomplishes this and at the same time holds out certain promises for the eventual production of stereoscopic motion pictures. The method consists essentially of coating a plate with a film, the front of which bears a series of ridges that present convex refracting surfaces to the light and serve as minute magnifying lenses. The thickness of this film is necessarily equal to the focal length of the refracting mediums. A double impression is obtained on the back of the film when an exposure is made, so that when viewed from a certain distance through the grooved side, a stereoscopic picture is seen. The ridged film is exposed in the same manner as smooth ones and does not necessitate the use of a two-lens camera.

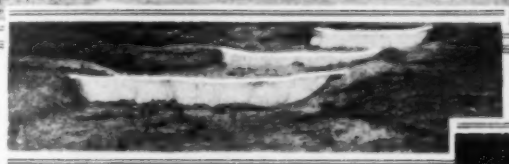
## SCOPE OF POSTAL SAVINGS BANKS BROADENED

In order to accommodate persons living in sparsely settled districts where post offices are not designated as postal savings banks, an extension of the service has been made which allows accounts to be opened and banking done by mail. By this plan the intending depositor makes application through his local postmaster, who identifies him at the nearest authorized office. Subsequently, transactions may be made direct to the postmaster at the banking point and money sent either by postal order or registered mail. Withdrawal of all or any part of a savings account may be effected by mail and without previous notice being given. Any person, ten or more years of age, is entitled to open an account in this manner. The amount of any account cannot be disclosed to other than its depositor, and married women may place money free from the control of their husbands. Printed instructions in 22 foreign languages concerning this new service are to be distributed to all post offices.

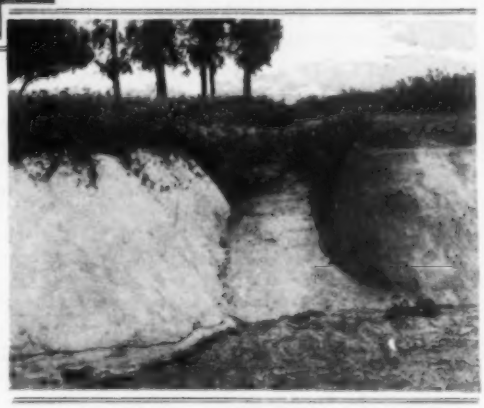
## NEW BAGGAGE CARRIER FOR AUTOMOBILES

One of the latest types of baggage carriers for automobiles is a sheet-steel case that is secured to the running board and is designed to hold a removable vulcanized-fiber suitcase. On an ordinary touring car about four of these cases may be used to advantage, arranged as shown in the illustration. An incidental advantage is that when the car is stopped over night the suitcases can be removed and the accessories of the car locked up in the carriers.

The Banks of the Cuts are Reinforced with Cement, to Preserve Golf-Links Hazards



In Certain of the Channels Concrete Dams have been Built to Lessen the Force of the Flow. At the Right is Shown a Cemented Path Leading from a Channel



## GOLF COURSE IS PRESERVED BY USE OF CEMENT

Cement has been used extensively at a country club on the Pacific coast in preserving a golf course which was gradually being ruined by cuts washed through it by storm water. The course lies in a valley, and following heavy rains a large flow of water is drained through it from the surrounding hills. The banks of the various cuts have been lined adequately with cement, so that the periodical rushes of water are now restrained from breaking through the sides of the ditches and starting new cuts, or broadening the old ones. Some of these are little more than two feet in width, while others vary from 10 to 15 feet across. In many of the channels, especially at points where the water rushes most swiftly, a series of low dams has been built several feet apart in order to break the force of the streams. In this way the injurious effects of the washes have been largely overcome, while the advantage of having the cuts as natural hazards has been retained.

## CHICAGO LEAGUE FIGHTS FLIES IN NEW WAY

Through the organization of a new antifly-campaign league, a movement has been started at Chicago which will, if successful, have the effect of causing a national boycott against dealers in food supplies who refuse to protect their stocks from infection by this pest. The work is essentially a propaganda of education directed at the housewife and depends largely upon her for its results. It aims to stimulate such a feeling of loathing against the fly and food infested with flies, that merchants in general will be compelled to conduct pestless, sanitary shops, or close their doors for lack of patronage.

## "HOUSE ELECTRICAL" SHOWN AT EXPOSITION

By the person who is only superficially familiar with the myriad of practical electrical appliances which have been developed for the home, a model Spanish bungalow, at the Panama-Pacific Exposition, in which electricity is made to perform nearly every domestic and personal service worthy of consideration, could not be looked upon as other than Utopian.

The rooms are heated, cleaned, lighted, and the air in them purified and cooled, by electricity, while intercommunicating telephones are provided between them. There are an electric fireplace with a luminous radiator in the living room, an electric piano player, electric door bells with an annunciator for the servants, and, also, an illuminated house number on the outside. In the dining room, the buffet and table hold sufficient equipment to allow a light, quick meal to be prepared without entering the kitchen. A warming closet is provided at the entrance to the butler's pantry, while at one side of the dining room is a breakfast alcove.

In the butler's pantry are a special dish washer for delicate ware, a disk stove for various purposes, an electric silver buffer, and other conveniences. The kitchen has an electric range, an electric water heater, and an ozonator and exhaust fan to carry off cooking odors. An electrically lighted and cooled refrigerator as well as a power-driven cream freezer is likewise provided. Electric toilet articles are placed in the bedchamber, dressing room, and toilet. A master switch with which every light in the house may be turned on is supplied. The toys in the nursery are electrical, the laundry is thoroughly equipped with power apparatus, as is also the workshop and garage, and the creamery is fitted out with an electrically driven separator, churn, and washer.

## DEEP WATER THROUGH CAPE COD CANAL PLANNED

Preliminary preparations are being made for deepening the new Cape Cod Canal to a 35-ft. waterway in order that it may be able to accommodate the largest battleships of the United States Navy. At the present time it receives vessels having a draft of 18 ft. or less. It is expected also that before long steps will be taken to protect the channel by erecting fortifications at its terminals. The waterway was recently constructed at a cost of about $12,000,000 and shortens the distance between Boston and Atlantic coast ports, south of Cape Cod, by 70 miles.

**In This Bungalow Electricity is Made to Perform Practically All Domestic and Personal Services. The Meals are Cooked, the House Cleaned, the Rooms Heated and the Air Freshened by Pushing a Button**

Concrete Amphitheater in Children's Dental Infirmary Recently Erected at Boston: The Ease with Which Cement Work may be Kept in a Sanitary Condition Makes Its Use Desirable in Hospitals

## CONCRETE AMPHITHEATER FOR DENTAL CLINICS

Concrete has been used in the construction of a clinic room in a new dental infirmary for children which has just been completed at Boston. This material was employed in preference to others because of its value from the point of sanitation. The benches, as well as the flooring, of the amphitheater are thus much more readily kept clean than if they were made of wood, as has most often been the case in older institutions. Concrete is rapidly coming to be more and more used in hospital construction, as it has been found particularly satisfactory for the purpose.

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¶One hundred tons of the leaves used in making absinthe have been publicly burned at Pontarlier, France, in accordance with the new legislation prohibiting the manufacture of this beverage.

## SHINING GLOVES ARE WORN BY TRAFFIC REGULATORS

Traffic policemen at St. Louis have been provided with white patent-leather gauntlet gloves which they are supposed to wear when directing vehicular travel at night or during heavy fogs. The reason for this is that the glossy surface of the gloves reflect the rays of light directed against them from street and motor-car lamps, which makes them so conspicuous that they can often be seen by a driver before the figure of the officer is discernible.

## FARM TRACTOR FORDS DITCH AND CLIMBS EMBANKMENT

What rightly might be considered a remarkable performance for a motor tractor built for farm purposes, was accomplished recently when one of these machines was made to ford a steep-sided irrigation ditch in California. The feat was not performed as a test, nor as a demonstration of the machine's power, but merely to save the time which otherwise would be consumed in driving a mile to the first substantial bridge. It made its way through the water and up the opposite embankment without difficulty. The performance illustrates graphically the capabilities of this type of machine and tends to demonstrate how it would act in working on soft or sandy soil.

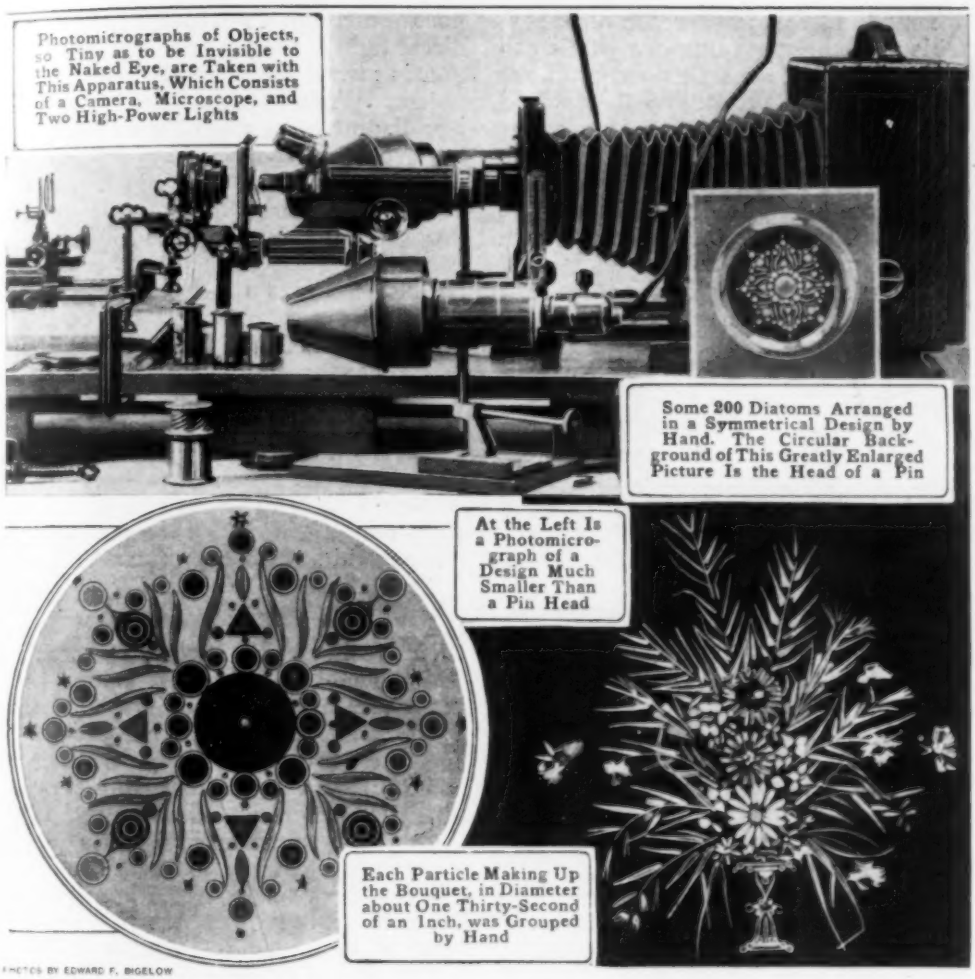
Fording an Irrigation Ditch with a Farm Tractor in Order to Save Time

## REPAIRING PIPE LINE IN FROZEN RIVER

Repairing a water pipe under four feet of ice in the Saskatchewan River with the current running at the rate of 12 miles an hour was the difficult and hazardous undertaking carried out at Edmonton, Alberta, Canada. The city is built along both sides of the river. The entire water supply for the south side of the city is through a pipe line laid across the bed of the stream, and immediate action was therefore necessary when a break occurred. A lane was first dynamited in the ice and a diver was sent down to find the break. Owing to the extremely low temperature, 40° below zero, the diver was able to work only 10 minutes at each trip. The pipe line was found to be covered with silt and gravel and it was necessary to remove this to get to the break. At the end of the lane farthest from the shore a pile was driven and to this was fixed a sheave through which was run a cable for working a bucket shovel, the cable and shovel being operated by a donkey engine mounted on the shore. With this equipment the pipe line was uncovered, the silt and gravel being piled up in an incline toward the shore, and the final work of repairing the break was done with little difficulty.

## CAMERA SHOWS WONDERS OF MINUTE OBJECTS

Photomicrography, which consists principally in making greatly enlarged photographs of microscopic objects, is an art which has been developed of recent years and is coming more and more into popular notice. It is particularly of interest because it uncovers to the naked eye the remarkable beauties of minute things, as well as worlds or fairylands of the tiniest, most infinitesimal sort, which have never before been so open to general appreciation as now because their study has not been possible without the aid of a microscope.


Photomicrographs of Objects, so Tiny as to be Invisible to the Naked Eye, are Taken with This Apparatus, Which Consists of a Camera, Microscope, and Two High-Power Lights
Some 200 Diatoms Arranged in a Symmetrical Design by Hand. The Circular Background of This Greatly Enlarged Picture Is the Head of a Pin
At the Left Is a Photomicrograph of a Design Much Smaller Than a Pin Head
Each Particle Making Up the Bouquet, in Diameter about One Thirty-Second of an Inch, was Grouped by Hand

PHOTOS BY EDWARD F. BIGELOW

At present, however, photographs of this nature are becoming more or less common, making it convenient for the layman to see, as has the scientist and student for years past, many of the striking phases of microscopic matter.

Some years ago an eastern jeweler engraved the Lord's Prayer on the head of a pin. This was justly considered a remarkable example of skill. It was also a thing which interested many persons who never saw the work itself, for its nature could be readily understood and appreciated without being illustrated. This, on the other hand, is not true of some work of much the same character and even greater interest which has been accomplished.

A bouquet with all the beauty of form that characterizes a flower-filled vase, or a shower of daisies, and yet smaller in size than the head of a pin, is one example of the things which, except for photomicrography, could not be fully appreciated by the average person. Bouquets of this tiny size have been made by persons adept at such work, as have other things of equal curiosity, and then photographed. The resulting pictures, several of which are shown in the accompanying illustrations, have been enlarged to such a point that unless informed as to their nature a casual observer would pass them over as being photographs of the ordinary kind.

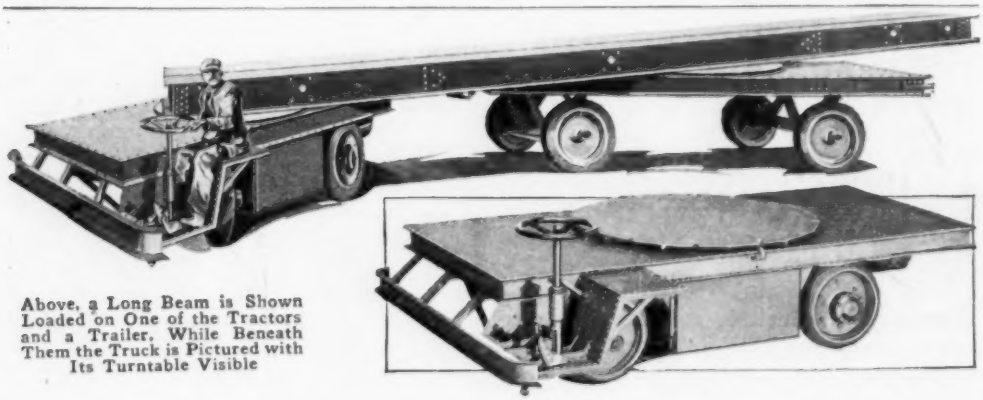
These minute "bunches of flowers"

are made of diatoms, which are vegetable growths consisting of a single cell whose wall becomes petrified after the death of the organism. By the use of a hair, these plants, smaller than a fine grain of dust, are lifted and grouped in symmetrical forms, several hundred of them often being used to make a single design. They are then covered with an extremely thin leaf of glass and preserved.

In taking the pictures of these tiny objects an apparatus consisting of a camera, a microscope, and high-power lighting equipment is used. The work may be done in different ways, but especially good results have been obtained by using reflected light, gained by placing projectors on two sides of the camera and focusing their light upon the object while making the exposure through a microscope. When a direct light is used it is of less intensity and is placed immediately back of the object. When an object and a plate are equidistant from a lens, the image impressed upon the plate by exposure is of the same size as the object. So, by setting the lens of a camera at its proper focal length from the object, and then placing the plate a number of feet back of the lens and beyond the focal distance, an enlargement is obtained. A long camera with a short-focus lens is frequently employed, as is also a long-focus camera when the plate is set four or five feet from the lens. Sometimes, by the use of section boxes, a plate is put as far as 24 ft. back of the camera lens in order to obtain the desired magnification, although this cannot be said to be a common practice.

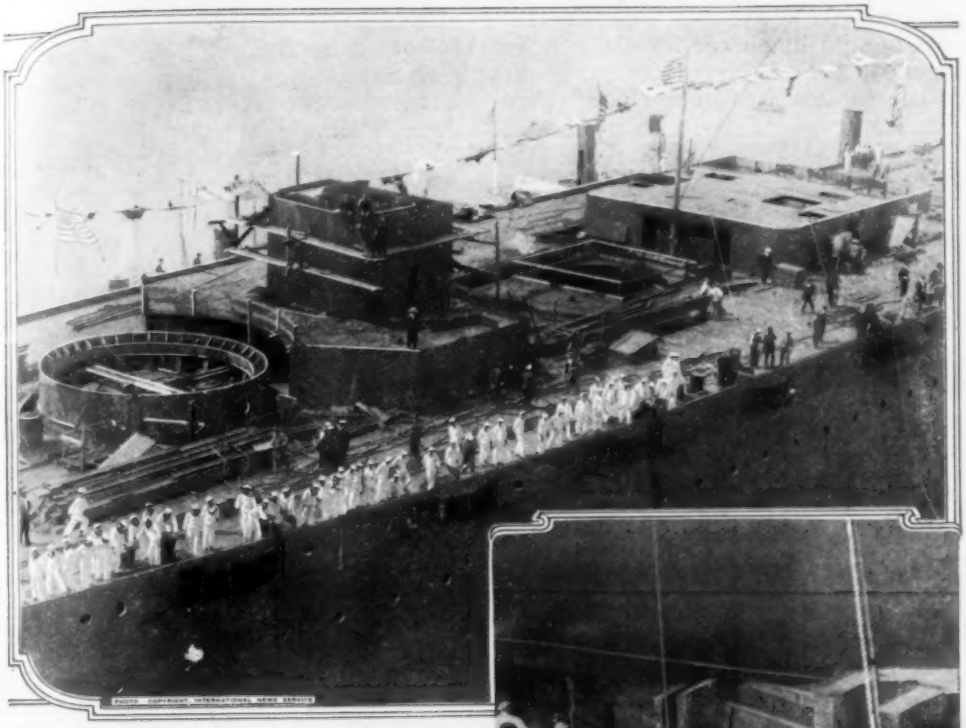
## TRUCKS WITH TURNTABLES BUILT FOR NAVY YARD

Electric shop tractors of a special design have recently been built for the government and are to be used at the Bremerton, Puget Sound, Navy Yard in moving heavy steel structural members between different points. They are reinforced to carry three-ton loads and when operating on the level are capable of maintaining a maximum speed of approximately five and a half miles an hour and cover about 30 miles on a single charge. Surmounting the steel platforms of both the trucks and their trailers are broad turntables which enable the longest beams that can be carried on standard flat cars to be transported without difficulty. These devices turn freely, making it possible for the tractors and cars to turn the corners of buildings and pass from main runways into cross aisles with their unwieldy loads. The driver's seat is offset from the body of the machine so that it is not in the way when it is necessary to place a beam in advance of the fore part of the tractor. Cast-steel wheels with 24-in. solid tires are used, while the power is derived from a 30-cell storage battery.



Above, a Long Beam is Shown Loaded on One of the Tractors and a Trailer, While Beneath Them the Truck is Pictured with Its Turntable Visible

# LAUNCHING OF GREAT AMERICAN DREADNAUGHT



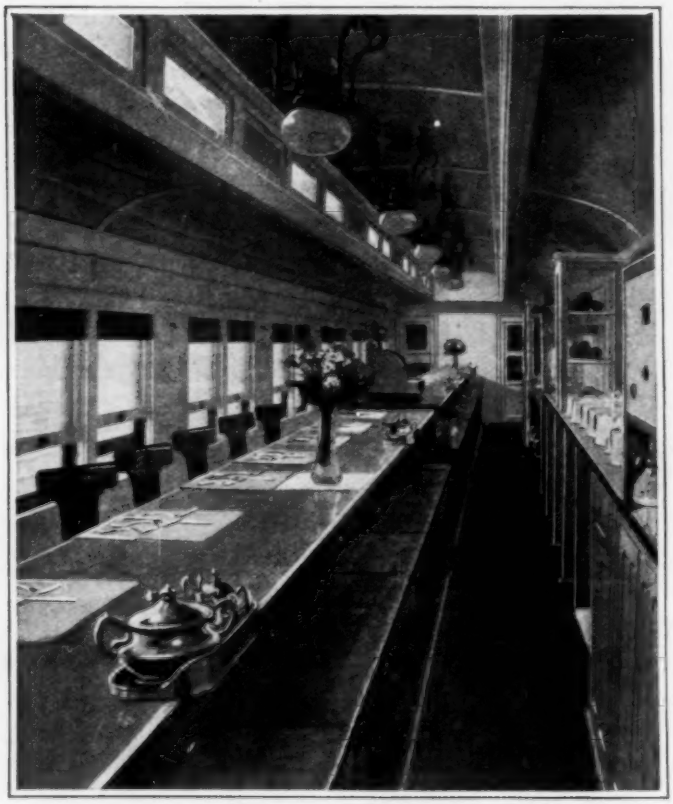
Deck View of the "Arizona," Showing the Base of One of the Revolving Turrets at the Left, as the Vessel was Towed to a Dock after Its Maiden Plunge in East River

An Interesting Launching View, Showing Workmen Releasing the "Arizona" from the Ways

Before throngs of cheering people the U. S. S. "Arizona," the sister ship of the "Pennsylvania," was launched in East River at the New York Navy Yard, June 19. When it is completed the dreadnaught will be one of the largest and most powerful war vessels afloat. It measures 608 ft. in length, has a 97-ft. beam and will be equipped with oil-burning engines. Its main battery will consist of twelve 14-in. guns and the secondary battery of twenty-two 5-in. rapid-fire pieces. The "Arizona" was christened not only with champagne, but also with a bottle of water—the first to flow through the Roosevelt Dam spillway. This was preserved at the time the dam was finished and saved for the recent ceremonies. The christening party, consisting of the secretary of the navy, the governor of the state, and others, occupied the official stand, while the ship's sponsor, an Arizona young woman, broke the bottle over the bow of the vessel, naming it "Arizona."

## RAILROAD RUNS LUNCH CAR FOR GOLFERS

A special lunch car for the convenience of golfers bound for golf links in the suburbs has been placed in operation by one of the railroads running out of Chicago, and by making use of this car with its quick service, the golfer is ready for the game as soon as he reaches his destination. This car regularly carries players to more than a dozen links scattered along the lake shore north of the city.



Interior of Lunch Car Placed in Service by a Western Railroad for the Convenience of Golfers

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¶ An automobile club in St. Louis employs a "first-aid" squadron consisting of expert mechanics who go out along the roads within 15 miles of the city on Sundays and stand ready to give aid to any car that is broken down or stalled.

## MODERN SEWERAGE SYSTEM FOR CAIRO, EGYPT

For disposing of the sewage of Cairo, Egypt, a modern system that has been under construction for about six years was placed in service in March, 1915. The principal feature of the system is a sewage farm containing 3,000 acres and located in the desert about 12 miles from the city. The central part of the city is divided into districts, each of which drains to a central station. From these stations the sewage is pumped by compressed-air ejectors to a central pumping plant from which it is forced through a long outfall sewer to the sewage farm by pumping machinery capable of delivering approximately 1,800 cu. ft. a minute against a head of 250 ft. Although placed in service, the sewerage system is only partly completed, the work having been seriously interrupted by the war. The farm is designed to utilize the sewage of a population of about 750,000.

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## NOVEL SIGN FOR PROMOTING RELIEF OF THE BELGIANS

A novel and effective method of appealing for aid in feeding the starving Belgians is being used in Pittsburgh. On a signboard, 17 ft. high and 49 ft. long, are painted various appeals for aid as well as a picture of an ocean liner putting out to sea past the statue of Liberty, while above the board there project two smokestacks and a real steamboat whistle. The

Realistic Sign Used in Pittsburgh in Appealing for Aid for the Belgians

whistle blows at intervals and smoke issues continually from the smoke-stacks. Steam for the whistle is furnished by a boiler used on a near-by construction job, while smoke for the stacks is furnished by stoves placed at the rear of the board.

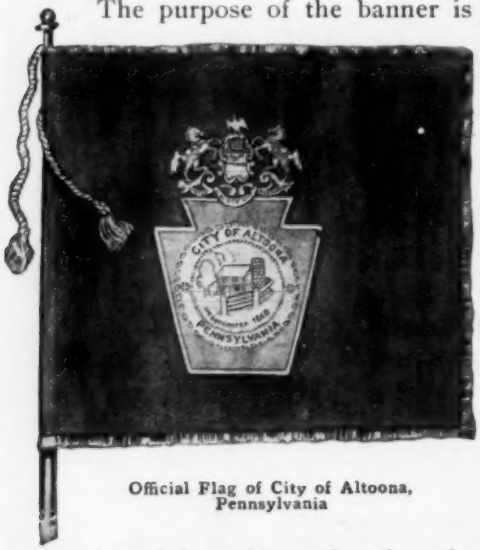
## MAN-POWER PLOW DESIGNED FOR FILIPINO FARMERS

Intended particularly for use in the Philippine Islands, where beasts of burden are scarce and human labor cheap, a man-power plow is being built which represents a great improvement over the crude implements heretofore employed by the natives for tilling the soil. It is provided with a single wheel at the front which by adjustment regulates the depth of the furrow to be turned. The propulsion power is gained by a long lever, extending in the rear of the implement, which when raised and lowered actuates an arm that pushes the share ahead. Because of the expense of draft animals, small farmers in the past have plowed their patches of ground for the most part by using crooked sticks or hitching two or more men or women to small plows. With the new tool it is possible for one man to do more and much better work than formerly has been accomplished by three, for with moderate exertion he can plow a fifth of an acre in a day.

COURTESY OF FARM AND FIRESIDE

## CIVIC FLAG IS ADOPTED BY PENNSYLVANIA TOWN

Following a local competition, the city council of Altoona, Pa., officially adopted a design for a municipal flag. The purpose of the banner is




Official Flag of City of Altoona, Pennsylvania

to arouse civic pride, advertise the community and stimulate allegiance to its home industries. The flag has a dark-blue rectangular field, one and one-twelfth times as long as it is wide, surrounded by a gold border. The design consists of a large keystone of blue outlined with white, on which is placed the seal of the city. At the top of the keystone is the coat of arms of Pennsylvania done in gold, black, pale green, and pale blue.

## MOUNTAIN ROAD IS BUILT BY MONTANA STUDENTS

As evidence of the democratic spirit which is manifesting itself in many of our state educational institutions, students at the University of Montana who were in need of part-time employment during the winter months accepted the work of building a road to the top of Mount Sentinel, at the foot of which the university campus is situated. The forestry school of the university is now to build a lookout for forest fires on the mountain.

## ZEPPELIN LOSES BATTLE WITH MONOPLANE

Official announcement of the most spectacular exploit so far performed in Europe's titanic conflict was made June 7 by the secretary of the British admiralty. It concerned the destruction of a Zeppelin dirigible in a daring aerial encounter 6,000 ft. above Ghent in Belgium. Six bombs were dropped on the hull of the German craft by Sub-Lieutenant R. A. J. Warneford, R. N., who attacked the enemy single-handed in a small Morane monoplane.

The battle in mid-air took place at three o'clock in the morning after the British airman had sighted the larger craft on the horizon between Ghent and Brussels while doing reconnaissance work. He flew directly over the airship and within 50 ft. of its upper surface. The last bomb burst the envelope, causing a terrific explosion which sent the bulky ship to earth, a fiery mass. The force of the detonation capsized the monoplane, but the pilot was able to regain control of it and make a spiral glide to the ground. He thereupon restarted his engine and escaped, subsequently landing on French soil near Cape Griz-Nez. A few days later while trying out a new machine, Warneford was killed in a fall with an American newspaper correspondent. It is reported that the kaiser, upon hearing of the airman's death, remarked, "He was a brave enemy."

Accomplishments similar to this were accredited to Roland Garros and other military fliers during the early part of the war. At first they were generally accepted as true, but since, most of the feats have been refuted. This is the first time that official announcement has been made of the destruction of an enemy Zeppelin in mid-air by a British, French, or Russian airman dropping bombs. Warneford, still a boy in appearance, was awarded the Victoria Cross by King George, and the Cross of the Legion of Honor by the French minister of war, for his bravery.

1-AEROPLANE DROPPING BOMBS
ZEPPELIN PARTLY ON FIRE
AEROPLANE CLIMBING TO ATTACK
2-AEROPLANE UPSET BY AIR DISTURBANCE CAUSED BY EXPLOSION OF ZEPPELIN
AEROPLANE MAKES FOR HOME
3-AEROPLANE WITH ENGINE STOPPED CLIMBING DOWN
APPROXIMATE COURSE FOLLOWED BY AEROPLANE IN FALLING AND RISING AGAIN
ZEPPELIN FALLING A BLAZING WRECK ON MONT St AMAND
EVERE AIRSHIP SHED IN FLAMES
BRUSSELS
GONTRODE AIRSHIP SHED
4-AEROPLANE MAKES FORCED LANDING BUT RESTARTS ENGINE AND ESCAPES
MONT St AMAND
GHENT

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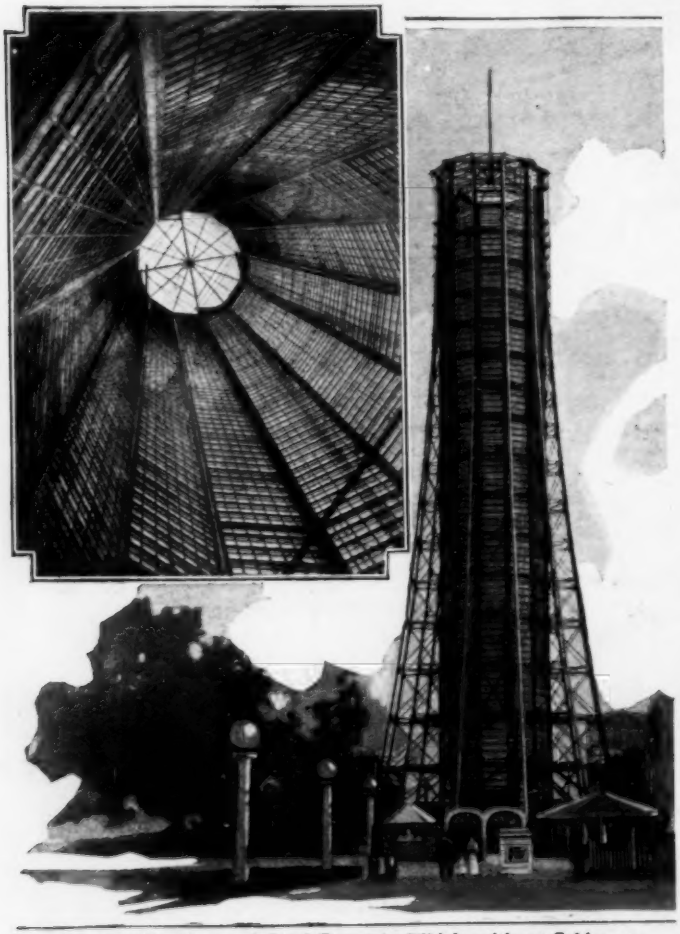
**This Illustration Shows Graphically How a British Airman Flying a Monoplane Attacked and Destroyed a Zeppelin over the City of Ghent Early One Morning in June. The Airman, Sub-Lieutenant R. A. J. Warneford, Now Deceased, is Shown in the Insert**

## ELEVATOR TOWER IS BUILT LIKE PNEUMATIC TUBE

To supersede the old-time Ferris wheel and giant seesaw for amusement purposes, an observation tower of very novel character has been constructed at one of Chicago's summer parks.



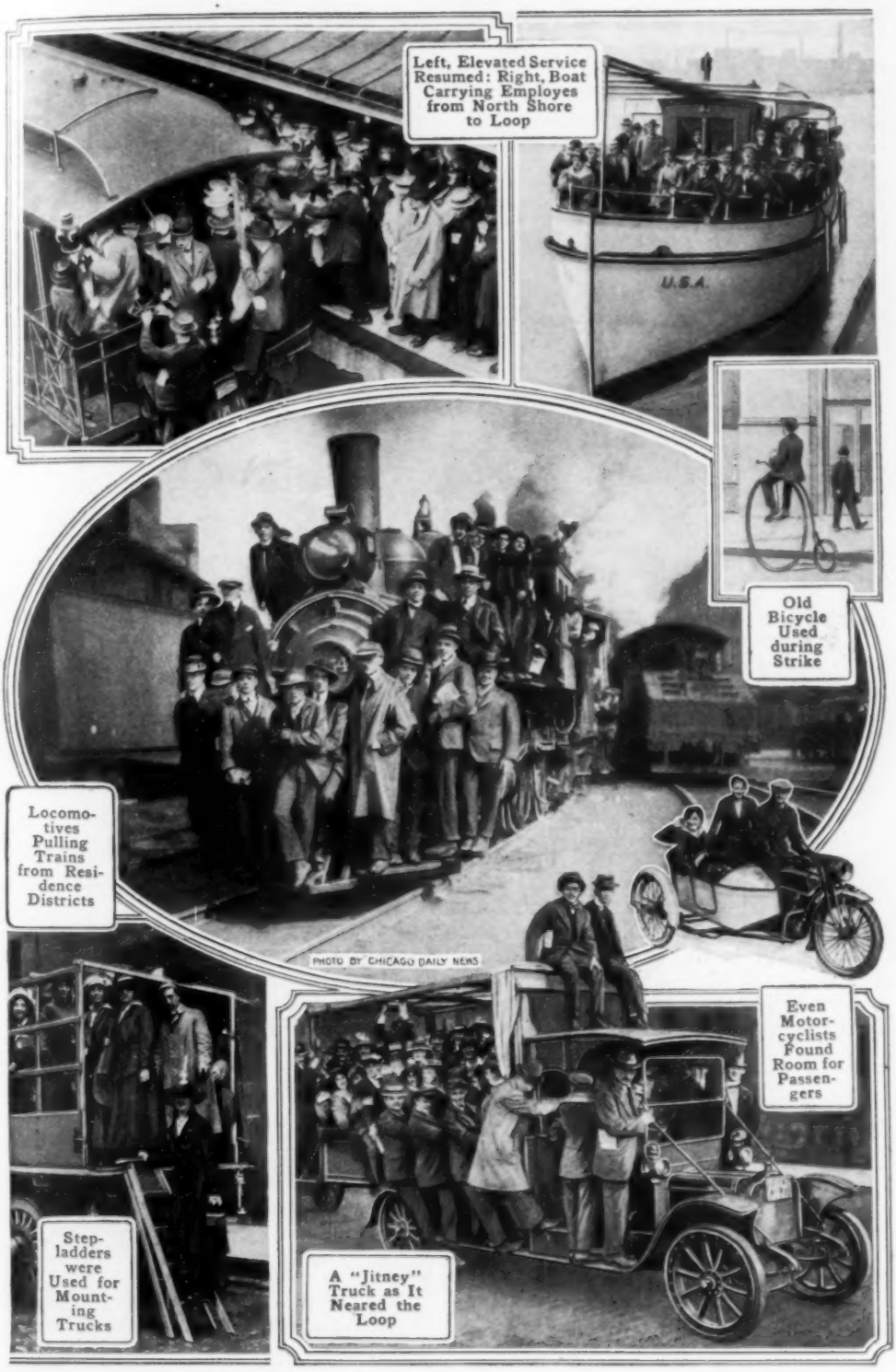
Remarkable Glass and Steel Tower in Which, without Cables or Plungers, a Large Elevator is Raised on a Cushion of Air to a Height of More than 200 Feet

The structure, which is built entirely of steel and plate glass, is twelve-sided in form, rises to a height of 214 ft., and is 30 ft. in diameter. Fitted in this, like a carrier in a pneumatic tube, is an elevator capable of holding 125 persons. This is literally blown to the top of the shaft by air pressure. There are no cables to lift it, nor is there a pneumatic or hydraulic plunger to push it. The car is raised and lowered in the steel and glass tower in precisely the same way that an engine piston is driven in a cylinder by steam pressure.

The tower, lately completed, has been in course of construction for several years. It is claimed that 150,000 tons of steel was used in it, while it is provided with more than a thousand separate window sashes and over 15,000 small plate-glass panes, which allow the passengers to see in all directions about them as they make the trip. The air is forced into the tower beneath the car by pumps which are driven by two electric motors, one of 100 hp. and the other of 125 horsepower.

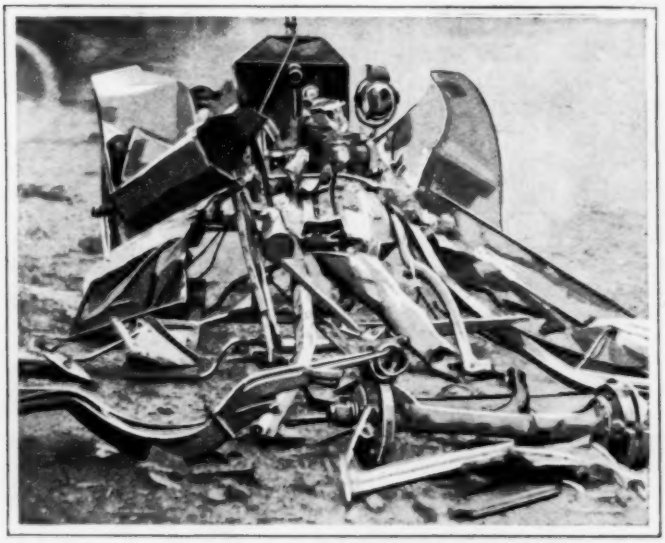
The pressure of the air amounts to approximately one-fourth pound to the square inch, giving a lifting force of more than 25,000 pounds. Since the glass is able to withstand a pressure of 10 lb. to the square inch, there is no danger of its being blown out by this force. The elevator makes the trip to the top of the shaft in about two and one-half minutes, while its speed in returning to the bottom depends upon the weight of its load. Air escaping gradually through rotary fans at the bottom of the tube allows the car to descend slowly on a pneumatic cushion. Portholes at the upper part of the tower permit air to escape when the elevator reaches the top, thus preventing it from being pushed out of the shaft. The operation of the device has been successful.

# CHICAGO GETTING TO WORK DURING CAR STRIKE


Left, Elevated Service Resumed: Right, Boat Carrying Employes from North Shore to Loop
U.S.A.
Old Bicycle Used during Strike
Locomotives Pulling Trains from Residence Districts
PHOTO BY CHICAGO DAILY NEWS
Even Motorcyclists Found Room for Passengers
Step-ladders were Used for Mounting Trucks
A "Jitney" Truck as It Neared the Loop

## BOX OF DYNAMITE EXPLODES IN MOTOR CAR

Four persons were killed and 18 others injured recently when a case of dynamite loaded in a motor car suddenly exploded. The accident occurred on the bank of a creek in New York state where a searching party was working to recover the body of a boy who had drowned in the water previously. The victims of this second tragedy, with one exception, were spectators who had been attracted to the place by the dynamiting of the waters. While the cause of the detonation is not definitely known, it is assumed that the man in charge of the explosive, who was fixing percussion caps for the dynamite, accidentally caused a concussion of some nature. The car was completely demolished back of the front wheels and radiator, which, oddly enough, were not destroyed.



The Remains of the Motor Car After the Explosion Occurred

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¶Many of the natives of Guatemala are expert toy makers, and a movement is now under way for developing the industry and making it a source of supply for the American market, formerly supplied by European makers.

## OPENING OF TUNNEL UNDER JURA MOUNTAINS

With the opening of the tunnel under the Jura Mountains on May 15, 1915, the last link was completed in the new low-grade railway route passing through Switzerland and connecting France with Italy. Work on the tunnel was begun in 1910 and was expected to be completed in May, 1914, but water bursts and other unexpected difficulties delayed the completion of the work for a year. The link of which the tunnel forms a part is 15 miles long, 13½ miles being in France and 1½ miles in Switzerland. The tunnel has a length of 6,670 yd., or nearly four miles. Owing to the heavy pine forests along the route the new line is well protected from snowstorms.

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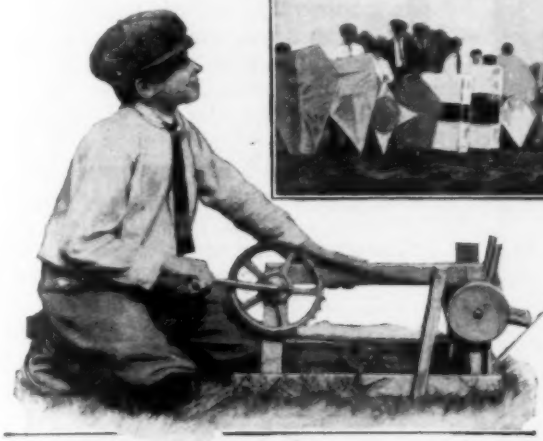
## SMOKESTACK IS CORRODED FROM UNUSUAL CAUSE

Within a comparatively short time after the erection of a large business building at Chicago, it became necessary to remove the top section of the steel smokestack, which was badly cor-

Because the Smokestack and Condenser Adjoined, Acid was Formed Which Corroded the Metal

roded. Responsible for this was the fact that the steam condenser and the stack had been placed side by side with their rims at the same level. This resulted in the sulphur gases and the condensed steam combining to the formation of sulphuric acid, which in turn caused the rapid deterioration of the metal.



Improvised Reel for Kite String

## INTERNATIONAL FLAG FOR WESTERN HEMISPHERE

At the recent Pan-American conference in Washington, D. C., where means for establishing closer commercial relations between the United States and the countries of Central and South America were carefully considered, a movement was started for the adoption of an international flag to be used by the merchant marine of all the nations of the western hemisphere. A flag, made by the great-granddaughter of the colonial seamstress who made the first flag for the United States, was presented to the conference for consideration. This flag is white and bears a single blue star.

¶The latest feature in office buildings is a garage located in the basement for the convenience of tenants.

## KITE-FLYING CONTEST HELD BY SCHOOL CHILDREN

Pupils of two rival schools at Cincinnati were recently pitted against each other in a kite-flying contest in which numerous kites of odd design were entered. Some of them were built like biplanes, pointed stars, and butterflies, while the old-fashioned bow kites as well as box kites, and others, were also in evidence. Prizes were awarded to the contestant who put his kite to the highest altitude, the one who let out the greatest yardage of cord, and to the boy owning the kite exerting the greatest pulling strength. In these events the bow kites showed their superiority over the others, for one of them succeeded in rising to a height of 705 ft. and another in flying at the end of 2,400 ft. of cord. The boy who won the latter event had constructed a reel, by using the sprockets of his bicycle, which proved to be of assistance in letting out and drawing in his kite.

Some of the Kites Entered in the Flying Contest Recently Held by the Pupils of Two Rival Cincinnati Schools

## RAILROAD STATION HOUSED IN PASSENGER CARS

After a railway station at Michigan City, Ind., had been destroyed by fire, leaving the companies which had occupied it without facilities for handling their local business, a number of passenger coaches were set out on an adjacent siding and converted into a complete depot. These served adequately to house the ticket, telegraph, and baggage offices and also provided

comfortable waiting rooms for the patrons. The locations of the various offices were indicated by overhead

An Improvised Railway Depot at Michigan City, Indiana

signs extended from the car platforms, while the customary bulletin board announcing the time of arrival and departure of different trains was attached to one side of the car which served as a ticket office.

## BUSINESS WITH AMERICA PLANNED BY BELGIANS

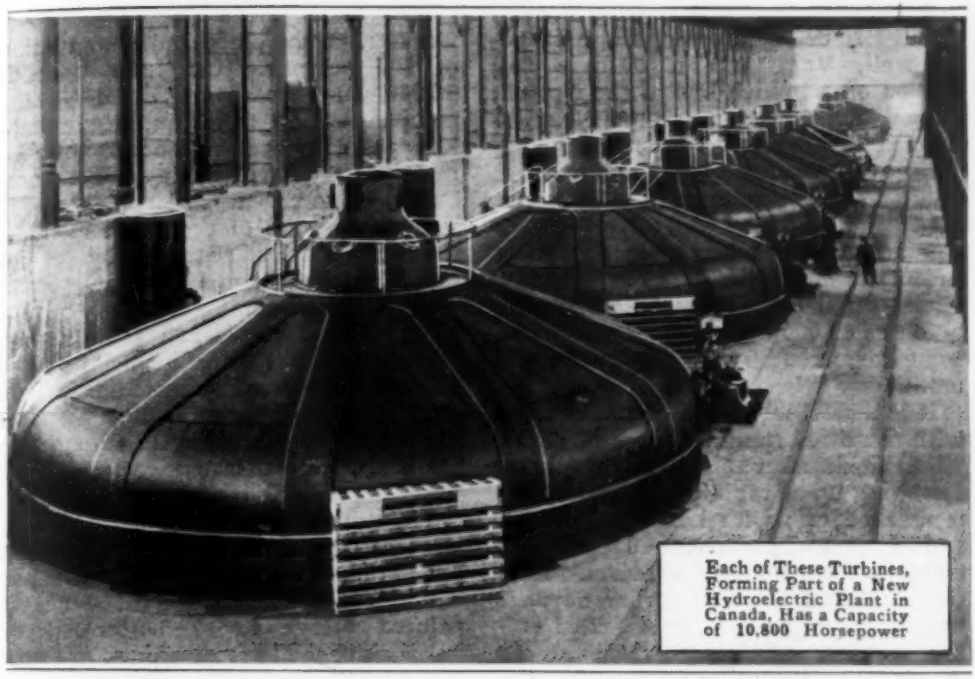
For the purpose of introducing our products on a large scale in their country following the close of the war, a group of Belgian business men have formed an organization which is now making arrangements for the eventual establishment of American manufacturing agencies in the principal cities of the kingdom. The plan contemplates giving employment to many Belgians who have been partly ruined financially, but who still have sufficient capital for such ventures.

## LOGIC IN SPEEDWAY DESIGN SHOWN BY CHICAGO RACES

Five world records were established without a death or accident occurring when Chicago's new speedway, a two-mile board oval, was opened with a 500-mile derby on June 26th. In spite of the unprecedented speed, averaging 97.6 miles an hour, which was attained by the winning motor car, at no time was there an excuse for a sense of danger to obsess the minds of the spectators.

The track is built for speed and safety, and the results of this race serve to uphold its design as logical and to indicate that sane motor racing is mechanically possible. On this course a race instead of being a battle between tires, is a contest between finely tuned motors. This was responsible for the establishment of a new racing record won by an English car which completed the distance without making a stop and finished fourth after averaging 95.06 miles an hour. The machine entered with its gas and water tanks full and coasted across the finish mark with them dry. Its pilot did not once take his hands from the wheel throughout the entire race and experienced no tire trouble whatever.

Some 5,500,000 ft. of lumber was used in constructing the oval, which was erected in the remarkably short space of 36 days. It is surfaced with 2 by 4-in. tamarack timber laid edgewise, forming a cool running base which is supported by square, 12-in. uprights placed on concrete foundations. The course has a width varying from 60 to 80 ft., and at the ends is gracefully banked to a height of 40 ft. The curves are graduated from 3° in the straightaways to 19° at the turns. It is this engineering feature which largely contributes to the success of the track, the design of which, it is believed, will be followed closely in building future speedways. The course is so laid that a car running at high speed has a tendency to keep to the oval instead of shooting to the outside, or off it, on the turns. This re-



Each of These Turbines, Forming Part of a New Hydroelectric Plant in Canada, Has a Capacity of 10,800 Horsepower

lieves the drivers of much strain, besides greatly minimizing danger.

The Chicago speedway has several interesting features in embryo which are more or less distinctive. It is backed by an association organized for the purpose of maintaining a year-around athletic field for outdoor sports of all kinds, motor racing being merely one of several activities fostered by it. The erection of an elaborate clubhouse equipped with sleeping and dining accommodations, ballrooms, and gymnasiums, is supposed to be started immediately. The membership of the club shares in the profits of the enterprise and is admitted free to all events. An 18-hole golf course is to be constructed in the 160-acre infield space, as are also tennis courts. Fifty-six acres of land has been reserved for a polo field and shooting range, while provisions have been made for a bridle path and a fast driving track. Both aviation and motorcycle events are planned to be held at the park, as are also military reviews and similar attractions which draw large crowds. These details are still to be worked out.

## NEW HYDROELECTRIC PLANT OF LARGE CAPACITY

Hydroelectric units that are the largest in the world in point of size and have the greatest capacity of any low-head turbines ever built have recently been installed and placed in operation at Cedars, Quebec, Canada. The plant now consists of ten 10,800-hp. main units and three 1,500-hp. exciters, and is to have ultimately 18 main units and six exciters of the same capacities. The turbines operate under a head of 30 ft. There is no dam, the water being conveyed to the turbines through a head-race that connects with the St. Lawrence River two miles above the plant. To save expense in the concrete in the substructure as well as to lessen the vibration in the units, the thrust bearings were placed at the tops of the generators.

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¶With a powerful wireless station, erected in Russia since the outbreak of the war, direct communication has been established between that country and England.

# FLAG STATION BECOMES CITY OVERNIGHT

SEVEN or eight months ago Hopewell, Va., was an obscure flag station on a branch line of the Norfolk and Western Railway some 15 miles from Petersburg. It was an unpeopled and practically unknown point out in a sleepy stretch of country where land could be purchased readily for $50 an acre. Today it is a city of probably more than 18,000 persons, where small lots are being sold for as much as $3,000 and $4,000 each and in some cases rented for $200, or more, a month.

It is a raw, wild, excited boom town with factories running day and night, with block after block of dwellings springing up as rapidly as a new street is marked off; with barracks, shacks, and tents everywhere, and hundreds more in the course of erection. Like Goldfield and Gary in earlier days, it has dozens of saloons, fly-infested eating houses, and improvised stores where a gaudy outlay of goods is displayed on packing boxes in crude, hurriedly built shacks made of rough lumber. Its buildings are unscreened, and sanitation is unknown. Garbage is thrown into the streets, and sewage carried off in open ditches. Drinking water is drawn from shallow wells. Flies swarm in clouds. Yet, in spite of all this, the town—which doesn't even know its real name and is called by a half dozen different ones—is one of the most interesting in America. Its population six months, or more, from now, it is estimated, may range between 25,000 and 35,000.

War orders from Great Britain and her allies for ammunition and high explosives so completely swamped a large American powder company that it was compelled to increase its factory facilities. The city of Hopewell, Va., is the result. Shortly before the first of this year agents for the corporation quietly purchased 1,200 acres of farm land adjacent to the flag station. This was inclosed by a 10-ft. barbed-wire barricade. Several hundred men were imported and set to work throwing up brick and concrete factory buildings. On April 1 the place had a population of 500 persons. On June 1 about 13,000 employes were listed on the company's pay rolls, and the inhabitants of Hopewell numbered approximately 18,000. Each day these numbers are increased.

Every minute of the day and night the factory site is patrolled by several hundred armed guards. No person other than an employe, unless he has a written permit issued at the main offices of the company in Delaware, is allowed within the barricade. The output of the plant is not publicly known. Two factories are engaged in the manufacture of guncotton and a third is producing cordite.

The town is properly divided into two sections. One of these is owned by the powder company, which has constructed approximately 500 neatly painted cottages for the better class of its workers. These dwellings are provided with piped water, fire-protection and sewage-disposal facilities. For the most part they are small houses of three or four rooms which company employes rent for from $6 to $10 a month. This district also has a large number of one-story barracks, built like packing or storage shanties, in which the laborers are housed.

The main street of Hopewell, like other sections of the town which are outside of the company's holdings, bears all of the appearances of the midway of a typical western mining town of the gold-fever days. It flanks the railway, which has grown from a single spur to a network of tracks, with a double row of shacks and tents.

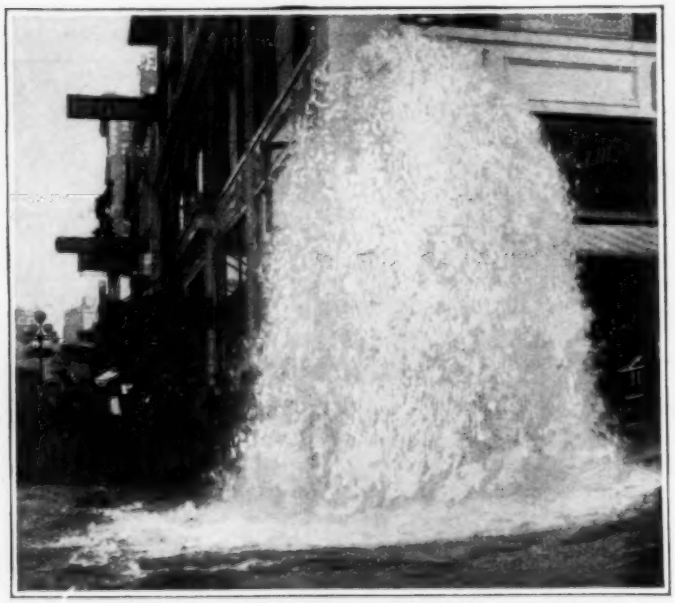
So far, the company has been silent regarding the permanency of the plant. No encouragement has been given by it to induce persons to make their residence or invest their money in the town. Nevertheless Hopewell continues to boom. Its development has been more rapid than that of any town ever before established in Virginia, and its existence is being felt by business firms in adjacent localities. Nearly every available motor car in

Back of These Barracks Are the Smokestacks of Some of the Powder Plants
The Tent Occupies a Lot 25 Feet by 75 Feet, Which was Sold for $400
This Shows a Section of a New Street being Rushed to Completion at Hopewell
This Photograph, Taken near One End of the Midway, Shows a Typical Row of Store Buildings. In Most of These, Packing Boxes Serve as Counters
Employes' Cottages Built by Company

the immediate vicinity has been pressed into service to carry persons between Petersburg and the new town. In the former place, scores of residences have been turned into boarding houses in order to care for the influx of people. Already a traction system is being projected between the two points, while electric transmission lines have been extended to Hopewell so that incandescent and arc lights are rapidly replacing the flaming torches at first used to illuminate the shop fronts along the main street.

## RUNAWAY MOTOR CAR FLOODS CITY STREET

An imitation geyser, from which the water gushed 30 ft. into the air, was made recently at Seattle, when a motor truck ran away down a hillside and snapped off a water hydrant. In an instant the busiest thoroughfare in the city was transformed into a torrent, and people and vehicles alike were compelled to scurry for safety. The flood continued for half an hour before the water could be shut off.



Imitation Geyser Caused by the Collision of a Runaway Motor Truck with a Water Hydrant in a Street in Seattle

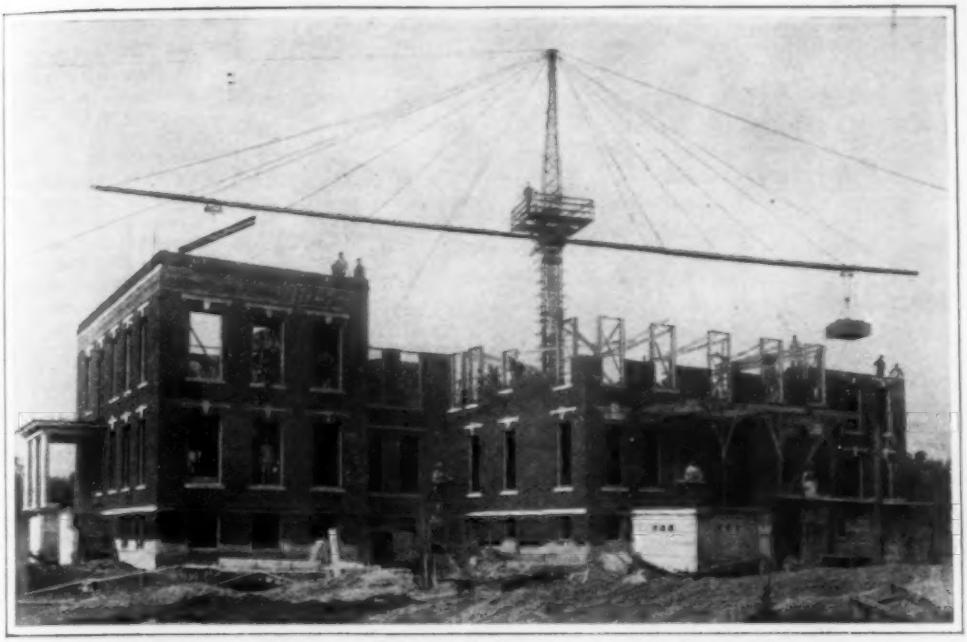
¶Owing to the scarcity of men through enlistment in the army it is planned to employ women in the surface works of a coal mine near Durham, England.

## BEAUTIFUL HEDGELIKE WALL PRODUCED IN FEW WEEKS

Ordinarily years of time and much attention are required in growing a high, thick hedge, but at the Panama-Pacific Exposition only a few weeks were consumed in producing a magnificent wall of greenery which towers several feet above the heads of persons of average stature and has attracted the admiration of thousands of visitors at the fair. While from a distance of but a few feet it bears all of the appearance of being a remarkable growth of hedge, it is in reality an artificially built wall which is made up of hundreds of shallow boxes of a shrub which has fleshy leaves and delicate white flowers. The plant was grown in the boxes until its greenery completely covered their top surfaces. The cases were then bound with wire netting, to hold the soil in place, and built one on top of another.

## NOVEL CRANE IS EMPLOYED IN ERECTING BUILDING

In constructing a building at Norwalk, Ohio, a contracting firm put into use a somewhat unusual elevating device to secure greater efficiency in handling and placing cut stone. It consists of a revolving derrick with a



**Odd Derrick Used in the Construction of a Building in an Ohio Town**

horizontal boom fitted with a trolley on each arm. The tower, which is placed in the middle of a building when construction is begun, is built up of angle posts and steel lattice, while the boom, which extends equidistant on both sides of the mast and reaches the four walls of the structure, is made of 8-in. web plate, under which angles are riveted to serve as a track for the trolley wheels. The hoisting is done by a 5-hp. motor, mounted at the base of the tower, which also furnishes energy for moving the trolleys in or feeding them out. The crane is rotated by a handwheel fixed in the crow's nest, where the braking is also done. It is claimed that on this particular building the cost of handling the construction materials was lessened approximately a third through the use of this hoisting apparatus.

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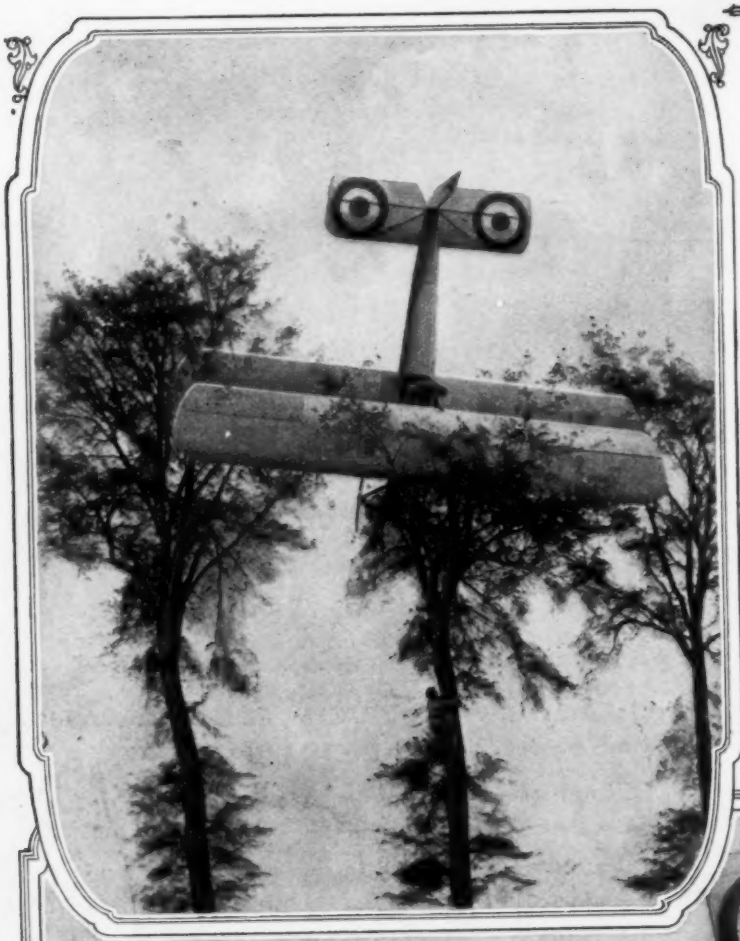
¶The Federal courts have prohibited the sale to any foreign government of the Bliss-Leavitt torpedo, which was first manufactured under contract for use by the United States.

## TWO PRICES FOR ICE WATER CHARGED AT FOUNTAIN

An unusual ice-water vending fountain is installed on one of the business thoroughfares at Los Angeles. It is provided with two separate slots, one for the insertion of nickels and the other for pennies. The reason for this is that the cent piece has not the circulation in California that it has in middle-western and Atlantic-coast states and is more or less rare. Thus if a would-be patron of the fountain is without a penny he is still able to purchase a glass of water by depositing a nickel. The drinking glass is washed by hydrant water before being used.

# SOLDIERS FELL TREES TO RESCUE AEROPLANE



AFTER every other plan of attempted rescue had failed to release a military biplane caught in the tops of three trees near one of the war camps in France, the trees were carefully cut down and the machine recovered in a damaged but not irreparable condition. The pilot, failing to estimate his clearance correctly while flying low, sailed into the uppermost branches. The momentum of the craft was sufficiently great to cause the body to rise to the position shown in the first photograph, which suggests that the machine had plunged head downward. The airman is seen crawling along one of the planes, while, beneath, an officer is climbing to the crippled machine to offer his assistance. In the lower photograph the French machine is shown on the ground after the trees which had snagged it had been felled.

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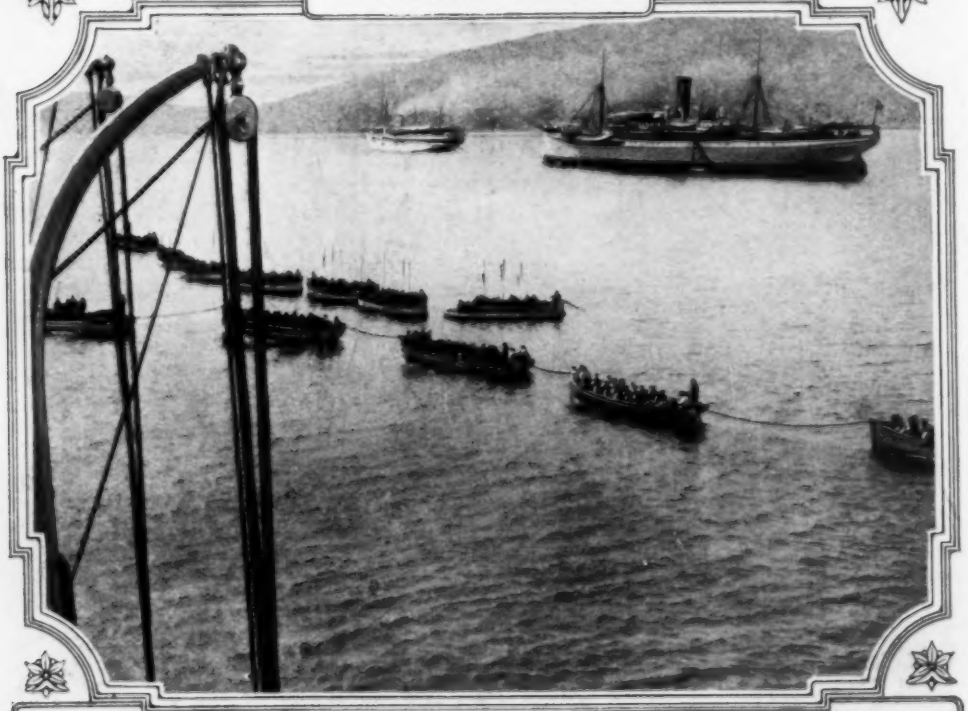
# HELGOLAND GERMAN SUBMARINE AND AERO BASE

Helgoland, Which 25 Years Ago Passed from British into German Possession, Is Now by the Irony of Fate the Kaiser's Dirigible Base for Operations against the English Coast. It Also Serves as a Supply Depot for Submarines in the North Sea and Is Convenient to Emden, Wilhelmshaven, and Cuxhaven

# EXPEDITIONARY FORCE LANDS AT DARDANELLES

Half-Starved Turkish Soldiers Shown Here Are Willing Prisoners of the British, Who are Interning Them in Captured Territory on the Gallipoli Peninsula



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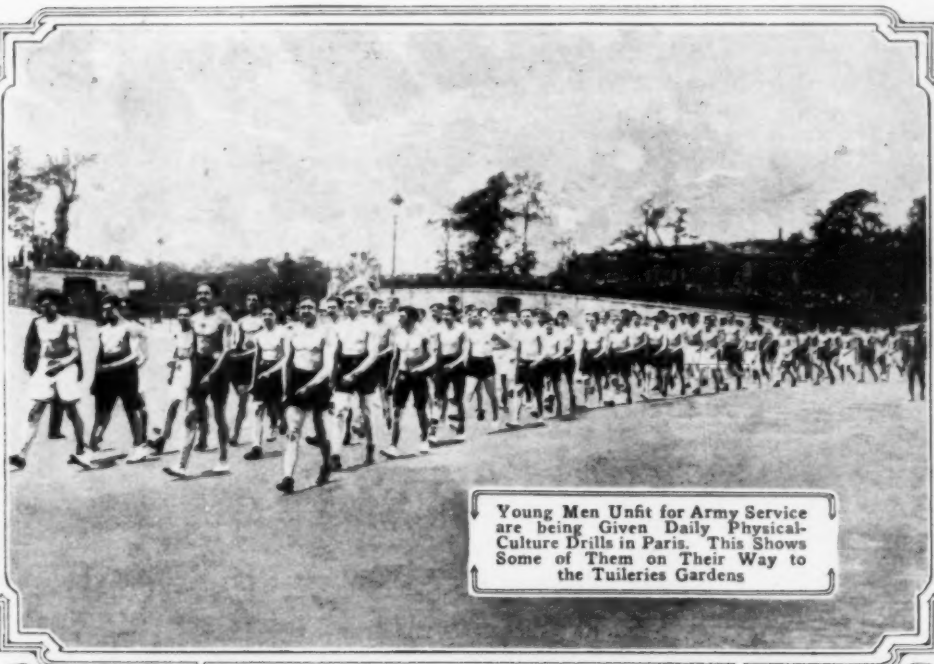
Allied Expeditionary Forces Making a Landing at the Dardanelles: The Open Boats, Filled with Men from an Adjacent Transport, are being Towed Ashore in the Face of the Enemy's Fire

# SCOTTISH TROOP TRAIN IN FATAL COLLISION

PHOTOS COPYRIGHT INTERNATIONAL NEWS SERVICE

One of the Worst Wrecks in British Railway History Occurred Recently When a Fast Limited Plowed into the Debris of a Scottish Troop Train and a Passenger Local Which had Collided a Moment Before. More than 150 Men were Killed and 200 Seriously Injured. A Track-Side Hospital is Shown Above; Smoldering Cars, Below

# HOME FORCES IN TRAINING FOR EMERGENCIES



Young Men Unfit for Army Service are being Given Daily Physical-Culture Drills in Paris. This Shows Some of Them on Their Way to the Tuileries Gardens

Women are Filling the Vacancies Created in Germany's Industries by the War and Keeping Various Public Utilities in Operation. Here a Class is being Instructed Preliminary to Serving as Street-Car Conductors. Those Who Act as Motorwomen Receive Careful Technical Drills

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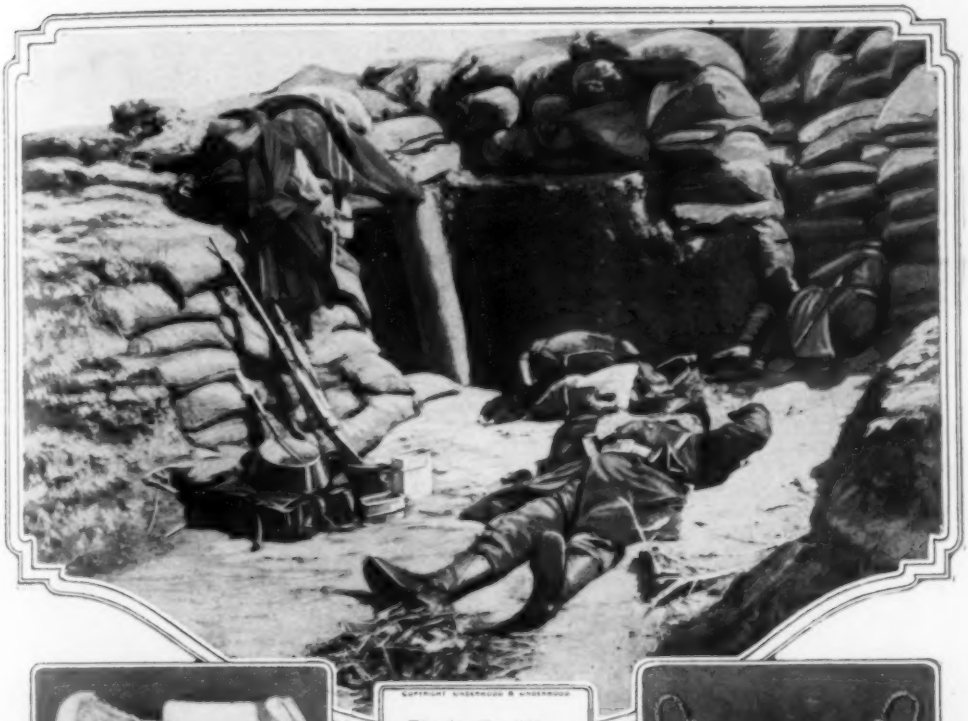
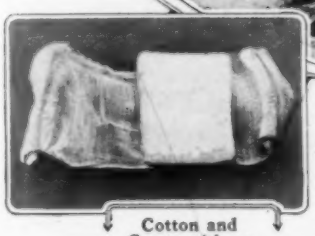
# COMBATING POISON GASES IN ALLIED TRENCHES



The Perils of German Gas Bombs Are Not Fictitious. This Glimpse of a French Trench Shows the Effect of the Heavy Vapors Which Spread over a Large Area



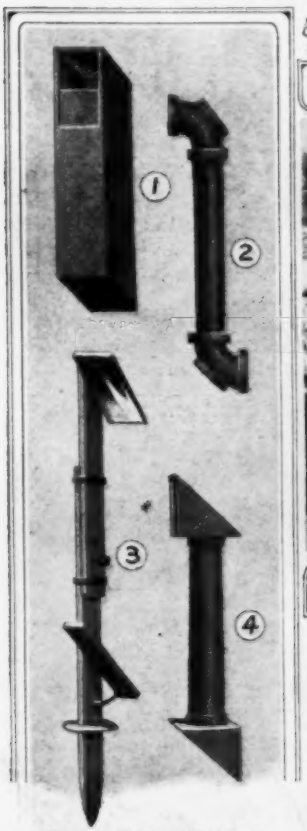
Cotton and Gauze with an Elastic Band Make Good Respirators

British Women have Made Thousands of Respirators for the Troops

English Soldiers Well Protected against Asphyxiating Gases and Prepared to Take Their Turns in the Trenches

# STRIKING SCENES IN BULLET-SWEPT TRENCHES

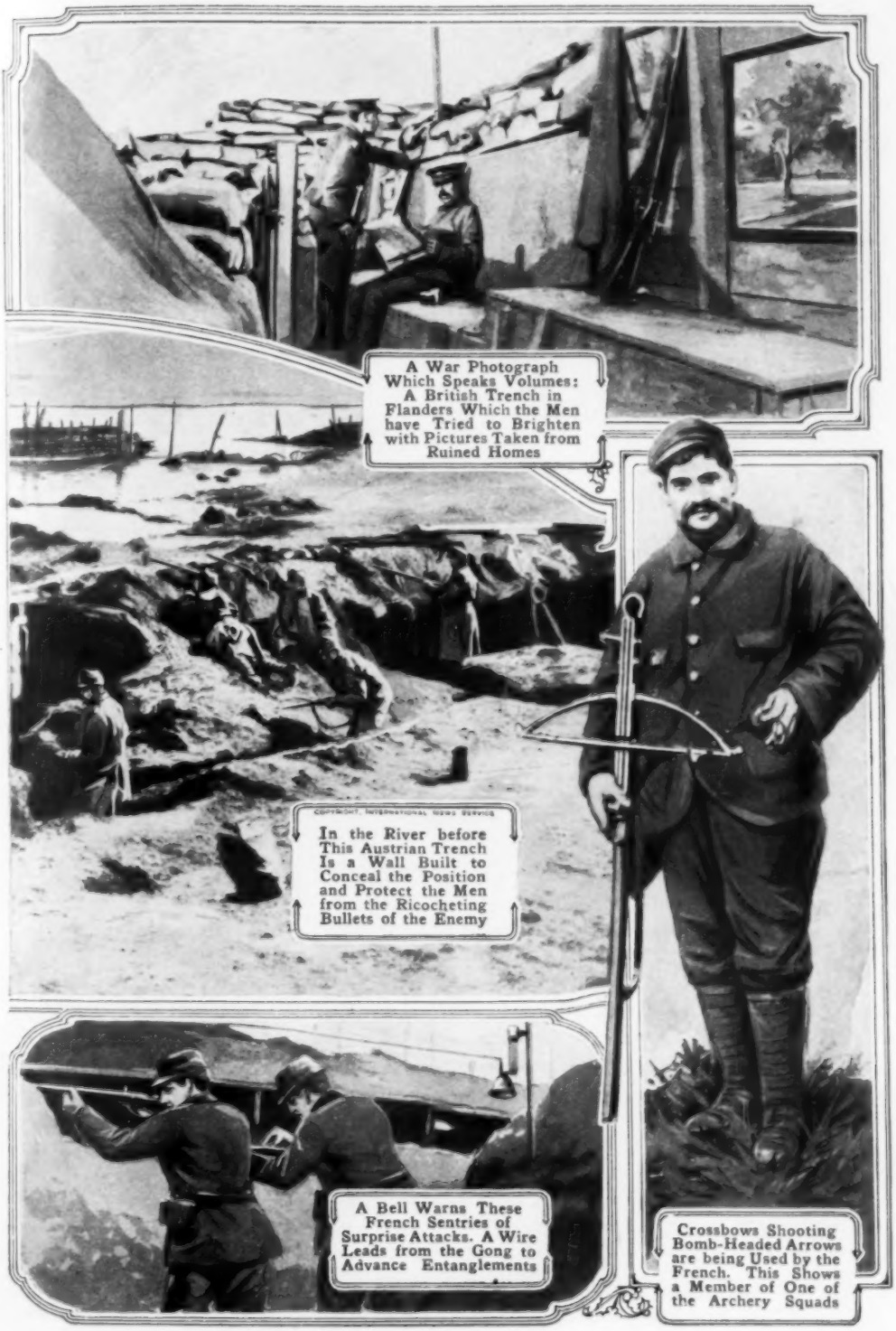
This Trench, Occupied by Native Soldiers in Austria, Extends along One Edge of a Forest and is Concealed by Underbrush and the Mottled Bark of the Birch




Forms of Khaki-Colored Periscopes on Sale at Many London Sporting-Goods Houses. Figures 1 and 4 Show Sheet-Iron Periscopes, While 2 is Made of Gas Pipe and 3 Is an Adjustable Wood Frame with Unprotected Mirrors. Most of the Devices Are About 30 Inches in Length

Austrian Artillery Officer Using a Distance-Measuring Glass on a Russian Position

## AND INTERESTING DEVICES USED FOR DEFENSE



A War Photograph Which Speaks Volumes: A British Trench in Flanders Which the Men have Tried to Brighten with Pictures Taken from Ruined Homes

In the River before This Austrian Trench Is a Wall Built to Conceal the Position and Protect the Men from the Ricocheting Bullets of the Enemy

A Bell Warns These French Sentries of Surprise Attacks. A Wire Leads from the Gong to Advance Entanglements

Crossbows Shooting Bomb-Headed Arrows are being Used by the French. This Shows a Member of One of the Archery Squads

# GERMAN INFANTRY IN ACTION ON FIRING LINE

Lined for a Considerable Distance along the Water's Edge, a Strong German Wing is Here Attempting to Defend an Important River Bank of Which It has Gained Possession

German Infantrymen being Rushed to the Firing Lines to Fill the Gaps Cut in Their Advance Ranks during a Sudden and Persistent Assault by the Enemy's Forces

Machine-Gun Operator Carrying His Rifle on His Back to the Rear of the Lines so That It may be Cleaned and Put in Order

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# ODD PHASES OF WAR AS REPORTED BY CAMERA

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Wire Netting is Used to Cover This Trench in Order to Protect the Soldiers from Bombs Dropped by German Airmen

PHOTO INTERNATIONAL NEWS SERVICE

Above Is a Three-Blade Propeller Used on Zeppelin Bombs Such as the Exploded Ones Shown Below

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Radio Plant aboard a Zeppelin, Allowing Communication with Military and Naval Headquarters

British Aerial Bomb Weighing 20 Pounds

"La Foudre" of the French Navy Provided with a Hangar for Sheltering the Flying Boat Canard Voisin

# INTERESTING SIDE LIGHTS ON EUROPEAN WAR

Housed in This Curious-Looking Tent, Erected in a Russian Camp near Warsaw, Is a Complete Field Bakery Which Supplies Bread for a Large Detachment of Soldiers

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German Soldiers Snatching a Few Minutes' Rest, on Improvised Beds Built in a Church, during a Lull in the Fighting between the Meuse and Moselle Rivers in Northeastern France

# WAR DEMONSTRATIONS MADE BY ITALIAN PEOPLE

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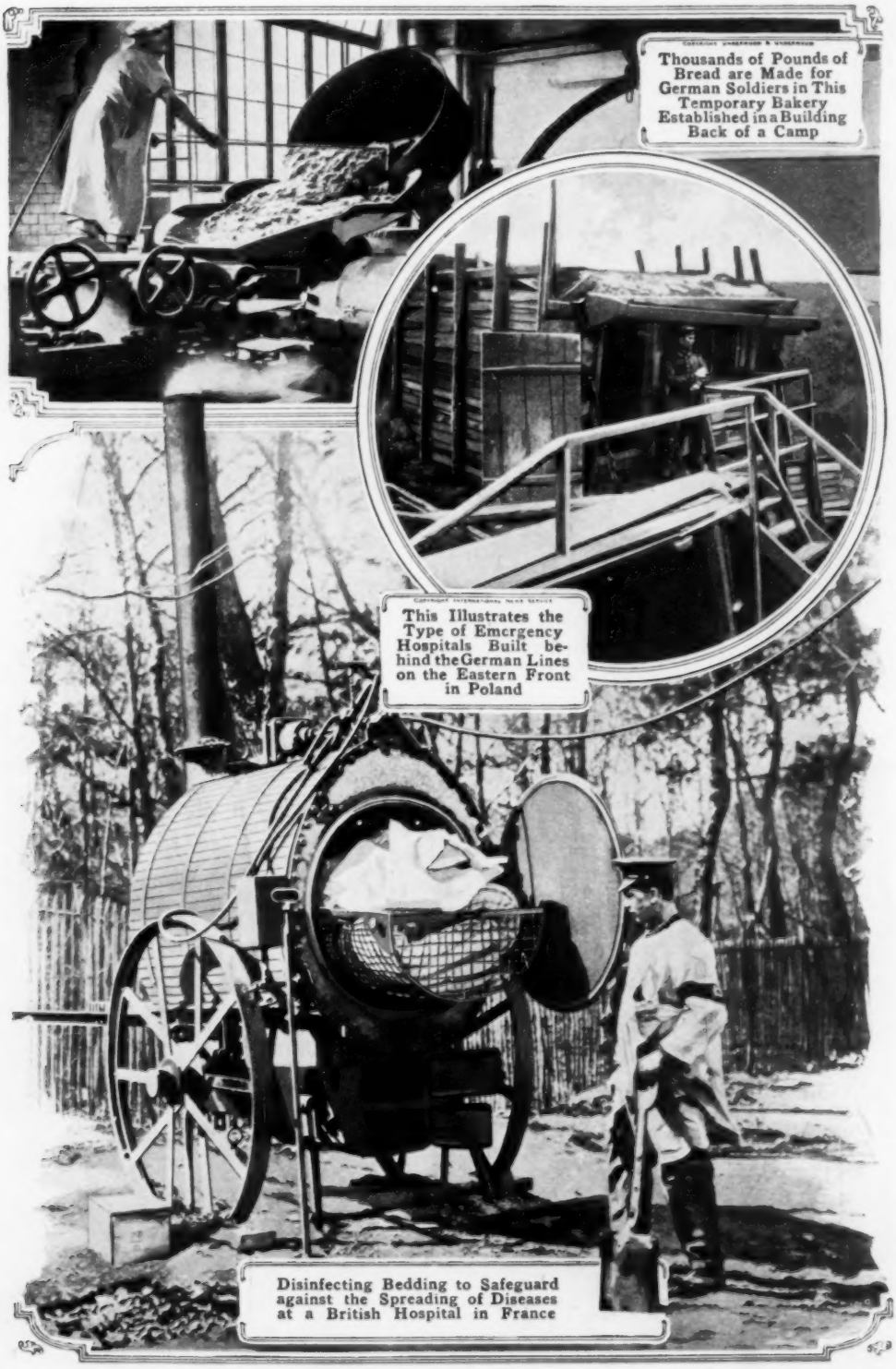
Italians before Their London Embassy Demanding a Speech from the Ambassador Following Declaration of War against Austria

The Unveiling at Quarto, near Genoa, of the National Monument to Garibaldi and His Band Who Fought for Italian Unification, Kindled a Great Pro-War Demonstration Prior to the Opening of Hostilities

PHOTO COPYRIGHT UNDERWOOD & UNDERWOOD

# PROMOTING THE WELFARE OF THE SOLDIER



Thousands of Pounds of Bread are Made for German Soldiers in This Temporary Bakery Established in a Building Back of a Camp

This Illustrates the Type of Emergency Hospitals Built behind the German Lines on the Eastern Front in Poland

Disinfecting Bedding to Safeguard against the Spreading of Diseases at a British Hospital in France

## GOVERNMENT TO SELL VILLA SITES AT AUCTION

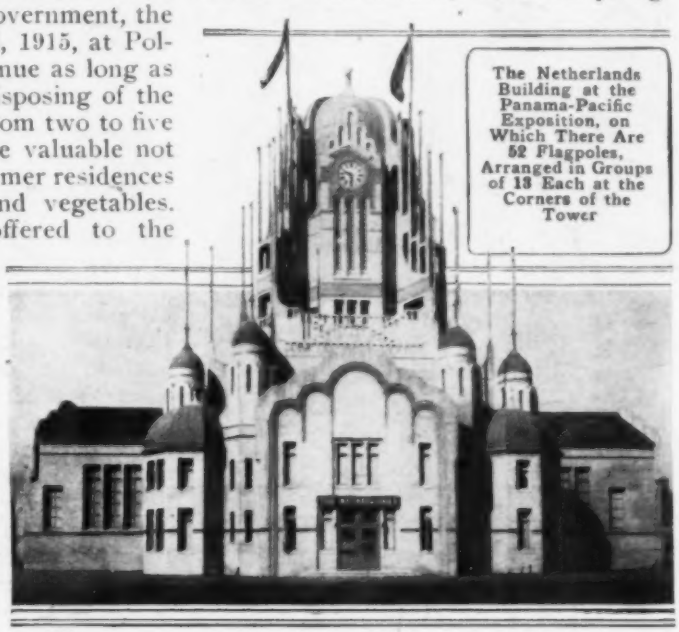
Twenty-one villa sites fronting on Flathead Lake in Montana are to be sold at auction by the government, the sale to begin on July 26, 1915, at Polson, Mont., and to continue as long as may be necessary for disposing of the land. The sites range from two to five acres in area. They are valuable not only as locations for summer residences but for raising fruit and vegetables. Each site is to be offered to the highest bidder, but will not be sold for less than $10 an acre. A cash payment of 25 per cent of the price bid will be required of each buyer on the date of the sale, the remainder to be paid in from one to three years, depending on the total amount bid for the site. Bids may be made either in person or by an agent, but no bids can be made by mail. There are no restrictions as to age or citizenship.

## USING TIME-HONORED JOKE AS ADVERTISEMENT

In Ellensburg, Wash., a tailor who has a sense of humor and believes that the same is true of most persons, employs a barrel as a sign. For the benefit of the few who are possibly ignorant of one accredited use of barrels and who therefore might miss the significance of the object before his place of business, he has attached a placard which is more candid than subtle.

## EXPOSITION BUILDING HAS FIFTY-TWO FLAGPOLES

No other building in the world, so far as can be learned, has as many flagpoles as the quaint structure in which the exhibit of the Netherlands at the Panama-Pacific Exposition is housed. Grouped about each corner of the tower are 13 flagpoles, making a total of 52 carried on the entire building.

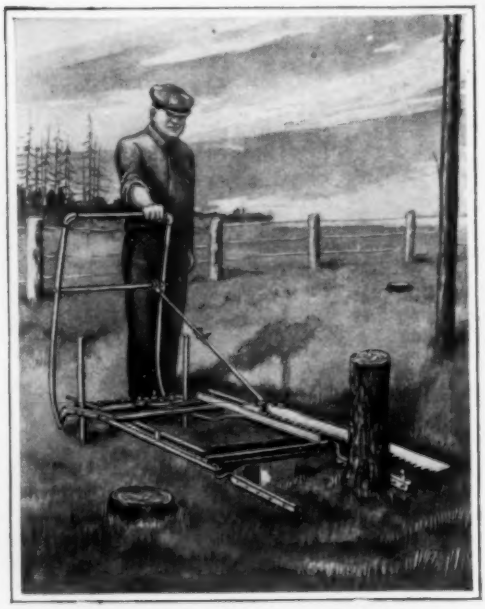


The Netherlands Building at the Panama-Pacific Exposition, on Which There Are 52 Flagpoles, Arranged in Groups of 13 Each at the Corners of the Tower

## SAW LEAVES NO BIG STUMPS AFTER FELLING TREES

A machine designed particularly for cutting trees close to the ground, so that large stumps will not be left projecting above the surface after timber is cleared from lands, has recently been perfected by two Maine inventors. The apparatus consists essentially of a low framework which carries a large saw and fits about the base of a tree close to the ground, or beneath the normal level in case excavating is first done about the roots. Two horizontal arms extending at the front of the frame, adjacent to the saw edge, are intended to be adjusted so that they fit about a trunk to hold the device rigid during

the work, while the saw is operated by one or more men by working a vertical frame which extends to a height that makes it unnecessary for them to bend



Unlike the Ordinary Crosscut Saw, This Device may be Operated by One Man

over in cramped or unnatural positions while felling a tree. A member on which a lumberman places one of his feet while working, serves to brace the frame and hold it firmly to the ground.

## EXCAVATION COST LESSENED IN SINKING SHAFT

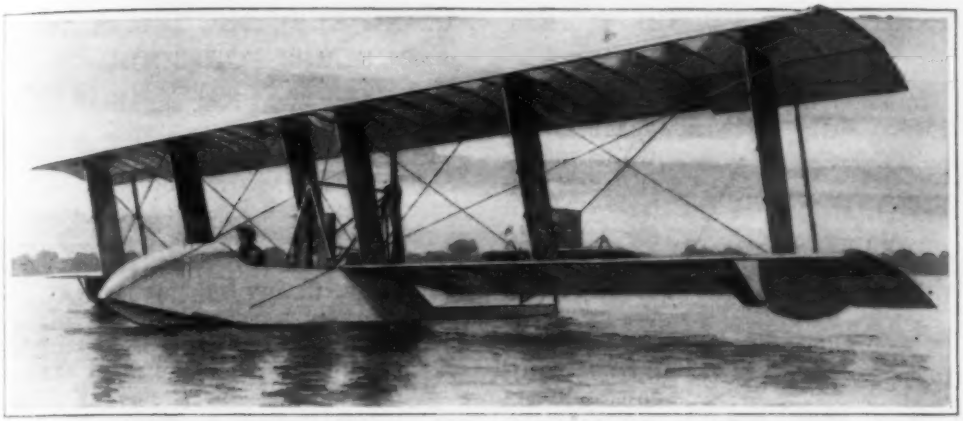
An interesting piece of engineering work was recently accomplished in New York when a permanent shaft was sunk at the foot of Broad Street to enable the construction of rapid-transit tubes under East River. A material saving in the expense of the undertaking was made by employing a method which cut down half the amount of excavating that had to be done under air pressure. This was accomplished by cutting only a ring under the exterior wall of the round caisson, instead of removing all the earth. By this plan a core was left within the ring, to be removed after the caisson was sunk and sealed to rock. In constructing the latter, a concrete ring about 16 feet in height was made after the cutting edge had been completed. This was then sunk until its top was a couple of feet above the surface, when it was stopped and the second ring poured. The sinking was then continued, the forms reset, and the third ring molded.

## PARKING LANES FOR MOTORS IN WASHINGTON STREETS

As has been the case in many cities, the question of where the motor cars of business men could best be parked during office hours in the down-town section of Washington, D. C., has presented more or less of a problem. For a number of months, however, lanes have been chalked off in the middle of some of the thoroughfares on which there are no car tracks, and used for this purpose. The plan has tended to keep the curb lines unobstructed and allow freer access through the streets than in the past. While in some cities the idea has not worked out so well as

How Washington, D. C., Keeps Its Curbs in the Business Section Unobstructed by Motor Cars during Office Hours

it was at first hoped it would, it is apparently solving the question so far as Washington is concerned.



This Flying Boat Made a Record of 80 Miles an Hour in Recent Trial Flights over the Patapsco River, near Baltimore

## HIGH-SPEED FLYING BOAT OF A NEW TYPE

A flying boat of a new type that has just been subjected to tests over the Patapsco River at Fort McHenry, Baltimore, Md., has shown remarkable speed on the water and has made a record of 80 miles an hour in the air. The planes in this craft are staggered, the upper plane extending about 18 in. to the front of the lower plane, and it is claimed that this feature adds greatly to the lifting power of the machine. The uprights, of which there are six, are shaped like thin partitions, with edges to the front and rear, and are designed to offer the least possible resistance to the wind. They are attached to the centers of the planes. The hull of the boat is 25 ft. long over all, and in it are placed the control, engine, and seats for the pilot and three passengers. The covering of the bow is in the form of a half dome, and is made in two parts so that one part may be removed. The hull is provided with a V-shaped bottom, a construction that enables the craft to rise from the water without creating any considerable amount of suction, and to land on the surface of the water without excessive splashing.

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¶The production of Fuller's earth in the United States for 1915 was 2,387 tons greater than that for 1914, the difference in value being $33,896.

## TRICYCLE CHAIRS EMPLOYED ON EXPOSITION GROUNDS

An adaptation of the wheeled chairs, commonly used on the walks at various seashore resorts, has made its appearance at San Francisco in the form of tricycle chairs which are being used extensively at the exposition grounds. These vehicles are built with frames which at the rear are similar to those of ordinary cycles, so that they may be propelled by foot power, instead of being pushed, and cover ground much more rapidly than their predecessors.

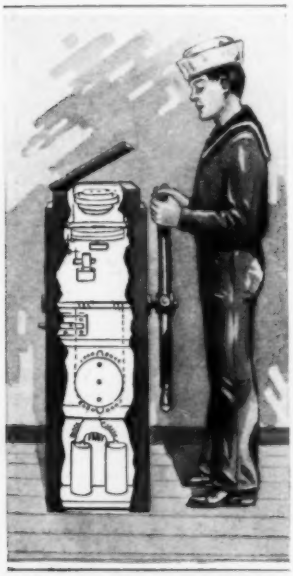
PHOTO BY ROCKWELL FEATURE SERVICE

Combination Wheel Chair and Bicycle Which is being Used in Carrying Patrons about the Exposition Grounds at San Francisco

A comfortable wicker armchair is carried at the front of the chassis, while the steering is done by means of two handles.

## TRAINING NAVY HELMSMEN ON DRY LAND

Members of the naval reserve are afforded little opportunity for actual training aboard a ship, and this makes it particularly difficult for them to become experienced at the helm. In the hope of offsetting this, a steering machine has been constructed which is intended to drill on land recruits who are totally unfamiliar with marine navigation, in the art of handling a wheel.



The device consists of a box, approximately a foot square and four feet high, attached to which is a steering wheel and within which is a compass mechanism that serves to present the novice with routine conditions encountered in navigation. At the top of this box is a standard compass, beneath which, and turning on the same axis as the compass card, is a wheel on which a bar magnet is mounted. The steering wheel controls through a rheostat a small motor geared to the magnet wheel, so that by turning the former to the left, for instance, the motor is started and the compass card moved to the right. A switch controlled by the instructor also allows the motor to be operated independently of the steering wheel, so that the card may be moved out of the course and the helmsman given an opportunity to learn how to bring his ship back in the course.

It is claimed that men drilled in this manner have later shown good work at the wheel on a training ship.

## USING ELECTRIC IRONS AND CURLERS FOR COOKING

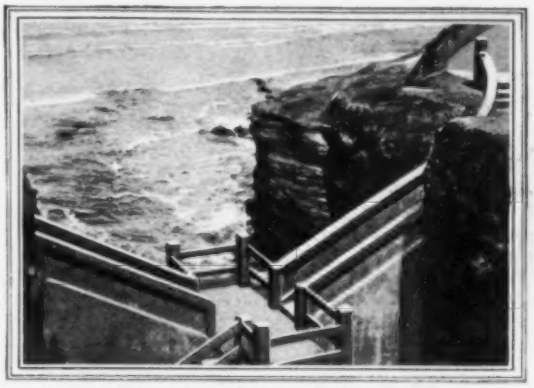
When the main that supplies Dallas and Fort Worth, Texas, with natural gas was broken recently as the result of floods, housewives and cooks in those cities were left for more than a week practically without means for cooking, as few of the houses are equipped with any but gas stoves. In this emergency every heat-generating device that could possibly be used was pressed into service. The most generally used devices were electric irons and curlers. Many housewives found that they could broil meat successfully on an electric iron, and that an electric curler served very well for making coffee.

## GASOLINE PUMP FOR MOTOR-CAR SUPPLY DEPOTS

For curb-line use before garages and motor-supply stations, a somewhat new type of gasoline pump has been developed that is fitted with safety devices which are said to reduce the danger of fire and explosions materially. Its mechanism is double-acting, so that a continuous flow of measured gasoline is available when needed. Both a discharge register and spring lock, as well as a filter, are provided, while a quantity meter is also supplied which keeps an accurate record in the aggregate of all pumping up to 100,000 gal. The pump is incased in a cast-iron cabinet from which a 1½-in. feed pipe extends to the supply tank buried beneath the ground. Surmounting the pillarlike cabinet is a post carrying a spherical globe inclosing an electric bulb which when illuminated is readily seen by passing motorists at night.

## PICTURESQUE PARK FOR CALIFORNIA RESORT

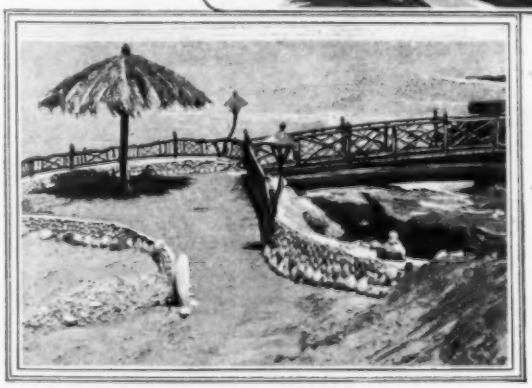
Along the cliffs facing the Pacific Ocean at Ocean Beach, Cal., one of the most picturesque parks in the country is now being developed. The work is being done by Japanese and the park is to be Japanese in style. The sandstone cliffs stand from 20 to 40 ft. above the ocean and have been worn into fantastic shapes by the continual pounding of the waves. This feature is taken full advantage of in the development of the park.



One of the Concrete Bridges in the New Park at Ocean Beach, California

Some of the miniature cañons cut back into the cliff are spanned by arched wooden bridges of a novel type for this country, but common in Japan. All beams and posts for the bridges, as well as the posts for the fences, are first charred. The charred parts are then scraped off until a surface mottled with brown and black is exposed. This process not only results in beautiful coloring, but brings out the grain of the wood. The bridges and the grounds generally are lighted at night by lamps set on lamp-posts made of trees of odd shapes, the lamps having conical covers made of bark and supported on the cut-off branches of the trees. The sunshades scattered about the grounds are also made from trees in which the branches have been cut off at just the right height to support the umbrellalike shades. In making the shades, a light framework of lath is attached to the branches and over this framework palm leaves are laid. The steps and walls are formed of rounded stones picked up on the beach and imbedded in concrete.

An Arched Bridge Built of Charred Wood; the Lamp-Post was Made from a Tree and Has a Bark Cover



Palm-Leaf Sunshade; Typical Walls Made from Beach Stones Imbedded in Concrete

## NEW TYPE OF ELECTRIC FAN FOR DINING TABLE

Intended especially for use on a dining table, an electric fan has been made which throws a continuous, indirect breeze in all directions. The blades are mounted at the end of a vertical shaft so that they revolve in a horizontal plane. Immediately above the fan is a deflector which spreads the air to all sides of a table. This provides a light, cool current of air instead of a heavy, concentrated draft, and does not have a fatiguing effect upon persons seated near the table.

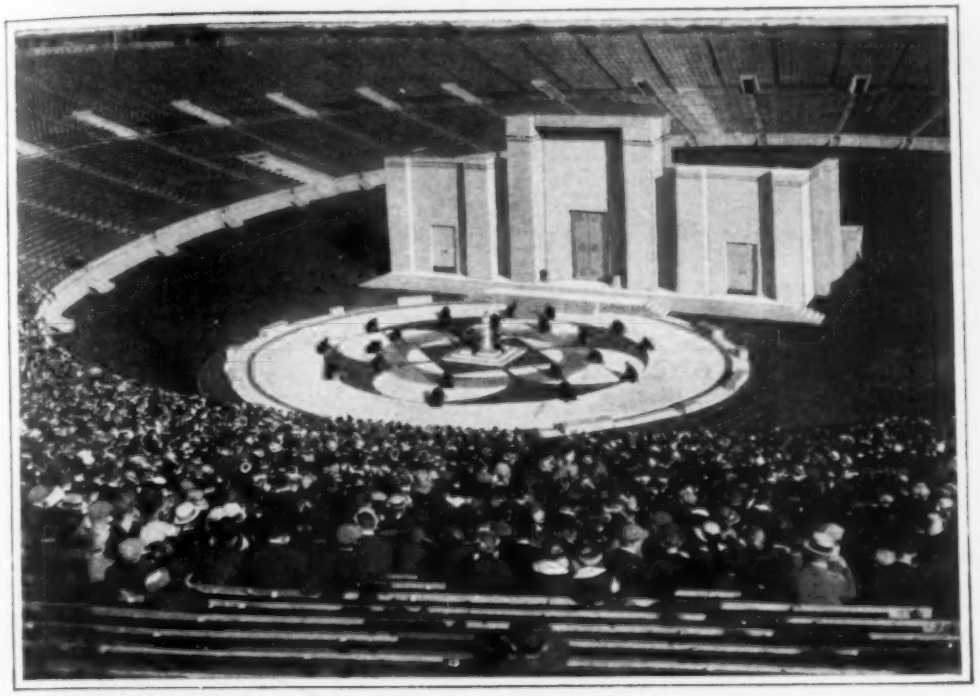
The Electric Fan Throws a Cool, Even Breeze to All Sides of the Table Continuously

## INEXPENSIVE INSULATION FOR STEAM PIPES

For covering low-pressure steam pipes with a cheap insulating medium, the use of a paste composed of starch and sawdust has been found satisfactory by engineers at Boulogne, France. The material may be prepared and applied easily. The sawdust is sifted so that the larger particles of wood are removed, the screening then being mixed with a very thin paste made of two parts wheat starch and one part rye starch. If the pipes to be covered are either cast or wrought iron, the paste adheres well, providing all grease is first removed from them. In the case of copper pipes, however, a thin priming coat of potter's clay should first be applied with a brush, while it has also been found advisable in all cases to wind a string spirally around the pipes to be treated. The spirals should be kept about a half inch apart. After the original coat of paste has set, other applications may be made until a covering of the required thickness has been built. Protection against the weather is given by painting the material with coal tar.

## ANCIENT GRECIAN PLAY STAGED IN YALE BOWL

Twelve thousand persons occupied a small section of the great Yale bowl at New Haven recently when Euripides' romantic drama, "Iphigenia in Tauris," was given in English for the first time in this country with an outdoor setting. The temple of Artemis, before which Iphigenia in the play performs rites of offering human sacrifices to the gods, was constructed in imitation of marble at one end of the gridiron before the audience. A stage made of painted canvas was arranged before this, in the middle of which was an altar about which the chorus was grouped when rendering its part in the performance. Because of the position of the audience, the usual difficulty of hearing the dialogues in outdoor plays was not experienced. The words could



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**Twelve Thousand Persons in the Yale Bowl Witnessing an Outdoor Production of "Iphigenia," an Ancient Grecian Drama**

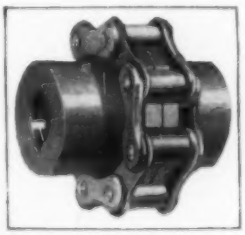
be heard distinctly. The vastness of this stadium can best be appreciated by comparing the blocks of vacant seats with those which were occupied. While a fourth of the stadium was reserved for the drama, and 12,000 persons attended, only a little more than one-half of the seats were used.

## STATE OF WASHINGTON ASKS FOR FORTIFICATIONS

Adequate fortifications for protecting the coast from invasion from the Pacific is asked for in a memorial recently submitted to the President and the Congress of the United States by the state government of Washington. In this report the defenselessness of the coast of Washington and Oregon is given in detail. Particular emphasis is laid on the strategic value of Grays and Willapa harbors to an invading force, and the necessity of providing strong fortifications at these points.

## SIMPLE FLEXIBLE COUPLING FOR PROPULSION SHAFT

A flexible shaft coupling has recently been invented which is very simple in form and apparently equally dependable. Flanges fixed at the adjacent ends of the shafts to be joined are toothed like an ordinary sprocket. A chain is linked about these, holding them firmly but with sufficient play to allow the shafts to center themselves readily. Flexibility is given at all speeds, and the coupling, when used in a power boat, is able to take the thrust and pull of a propeller without trouble. An additional feature is the readiness with which a connection or disconnection may be made. When it is desired, a grease-tight housing is provided for the chain.



## IRON CORNER POSTS FOR PUBLIC-LAND SURVEYS

In all public-land surveys made by the U. S. General Land Office, hollow iron posts filled with concrete are now

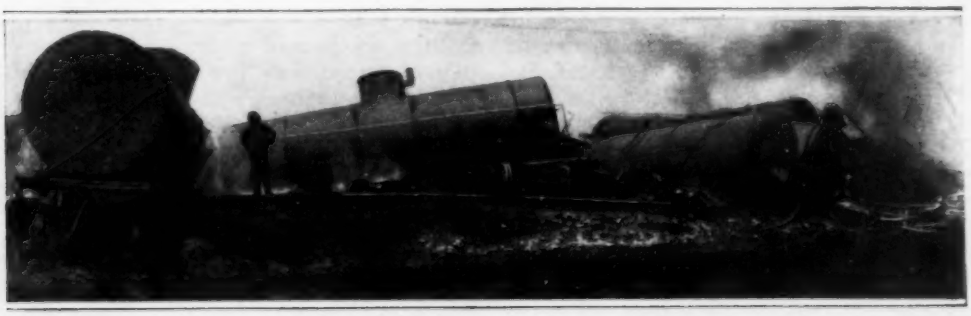
The Brass Cap of One of the Iron Corner Posts; the Designation of the Corner is Marked with a Steel Die on This Cap

Corner Posts Stowed in a Pannier for Transport across Country on Mule Back

used for marking the corners in place of the old-style corner stone, which was easily removed or destroyed. Each post is equipped with a brass cap, on which the designation of the corner is marked with a steel die, and has a spreading flange at the bottom. The posts are 3 ft. long and are made in three diameters. For marking township corners, the 3-in. post, weighing 30 lb., is used; for section corners, the 2-in. post, weighing 13 lb., and for quarter-section corners, the 1-in. post, weighing 6 lb. They are always set so that the markings on the caps are read from the south side of the corner. The posts are usually stowed in panniers designed for the purpose and transported to the required points on mule back.

## WRECKED OIL TRAIN BURNS FOR MANY HOURS

Thousands of barrels of petroleum and gasoline were consumed by fire when an oil train on the M., K. & T. Railway was wrecked recently near Fort Scott, Kan. A number of tank cars in the middle of the train left the track on a sharp curve. Several of them were hurled into a heap, while others were strewn along the right of way for nearly a hundred yards. Almost simultaneous with this accident, an explosion occurred which threw sheets of flaming oil over the greater part of the wreckage, causing the contents of nearly all the tank cars to ignite. Flames and clouds of dense black smoke enveloped the train for many hours. In all, 17 cars are reported to have been destroyed. A number of others at each end of the train failed to leave the track, and these were saved by timely work. The fore part of the train was disconnected and run into Fort Scott, while the caboose and four tank cars at the rear were drawn away from the burning debris by a local freight train which arrived at the scene shortly after the wreck occurred.



This Shows a Part of the Wreckage of an Oil-Tank Train as It Appeared after the Fire

# HANDLING TRANSATLANTIC MAILS IN WAR

BEFORE the outbreak of the war the Atlantic Ocean was interlaced with the paths of steamers carrying mail to and from Europe. This well-organized and efficient service was disarranged and all but destroyed, practically in a day, when the bulk of the international shipping was driven from the sea at the beginning of hostilities, and with the progress of the war the problem of maintaining any kind of regular service is becoming increasingly difficult. There are now only five routes regularly available for carrying the mails between this country and European ports. Most of the fast steamers have been withdrawn, sailings are frequently canceled, and of the ships remaining in the service few are able to maintain regular schedules. At the same time there has been only a slight decrease in the volume of mail transmitted, a feature that adds greatly to the problem confronting the postal authorities. The decrease in commercial mail has been offset by an increase in mail of a personal nature, and as a result the total amount handled is almost as great as it was before the beginning of hostilities. Increased correspondence between residents of the United States and friends and relatives in countries engaged in the war is given as the main reason for the enormous increase in personal mail.

In spite of the reduction in facilities for transmitting the mail, a fairly regular and thoroughly reliable service is being maintained, and this service extends not only to the allies but to Germany and Austria, countries that are practically hemmed in by their enemies. The reliability of the service is indicated by the fact that the 82 bags of mail that went down with the "Lusitania" was the first mail to be lost at sea by the United States as a result of the war.

With the allies in control of the sea, the transmission of mail to Germany and Austria is made possible only by the observance of international law by the allies. Such mail can only be landed at a neutral port. Mail matter carried on a neutral vessel bound for a neutral port cannot lawfully be interfered with, and the vessel carrying it, unless it also carries contraband of war, is subject only to the unavoidable dangers connected with traversing the war zone. If a vessel carrying such mail goes into a port of one of the belligerents, however, all mail matter bound for an enemy nation may be lawfully seized. For this reason any ship bound for Rotterdam, Holland, or a Scandinavian port and carrying mail for Germany or Austria is in effect barred from putting in at Liverpool or any French port.

Two old-world ports, Liverpool and Rotterdam, are now handling the greater part of the mail for the whole of Europe. All of the mail for England and most of that for France is landed at Liverpool, the latter being forwarded through London and across the English Channel. There is an occasional shipment direct from this country to Havre, France. All of the mail for Germany and Austria must now go through Rotterdam, Christiania, or Copenhagen, the greater part going through Rotterdam, from which port it is forwarded by rail to its final destination. Before Italy entered the war a large part of the mail for Austria went through Naples, but that avenue is now closed. Practically all mail for Russia goes to Christiania and thence overland to its destination. So far as the handling of the mails is concerned, Luxemburg and that portion of Belgium in possession of the Germans has the same status as German territory, the mail being landed at Rotterdam.

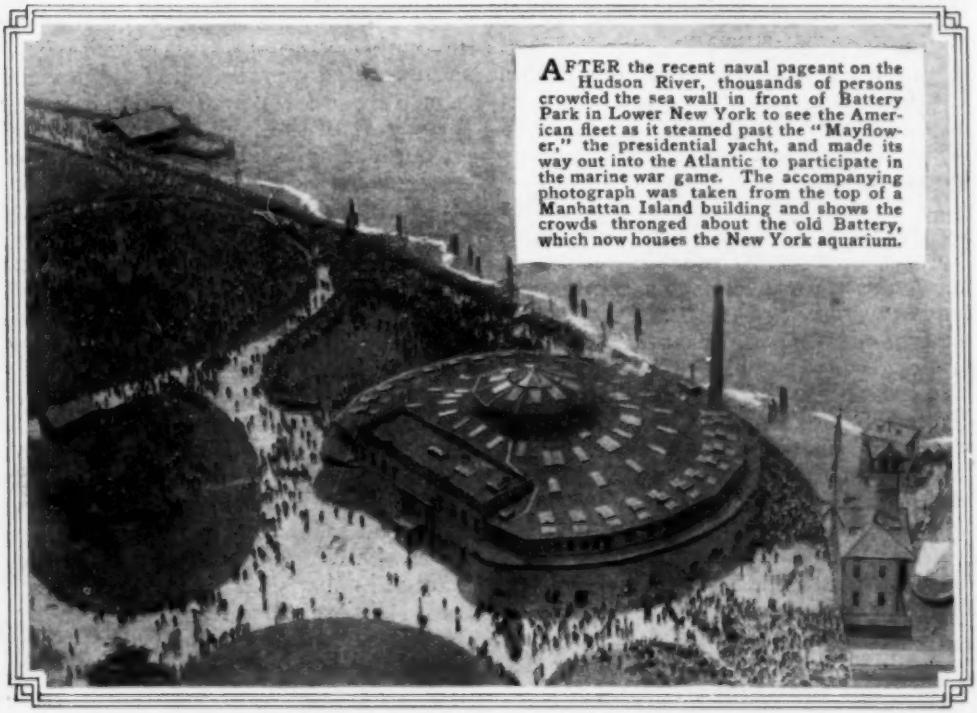
Contrary to popular belief, none of the mail matter sent abroad from this country is censored by the United States postal authorities, the situation in this respect being exactly the same as it was before the war. The letters for a belligerent nation are simply placed in bags and these bags are sealed before they leave the country. On the arrival of the mail at its destination the responsibility of the United States ceases and any question of open-

ing and examining the mail, like that of censoring outgoing mail, is a matter subject to the military regulations of the country to which it is sent.

When a state of war exists between two countries, peaceful relations of every kind are cut off automatically, and this condition applies as rigidly to the transmission of mail as to commerce and diplomatic exchanges. There is now no regular way, for example, for getting mail from England to Germany. There is doubtless some secret communication between persons in these two countries, but there is no way of forwarding letters except by a personal carrier or through an agent in a neutral country.

In times of peace most of the mail for England and a great part of that addressed to points on the continent was landed at Plymouth, England, a port that has since been closed as a result of the war. The continental mail was then rushed through London to Newhaven or Dover, where fast steamers were in readiness to carry it across the English Channel. The reason for this arrangement was that faster time could be made than by landing the mail at a continental port. Under normal conditions mails were delivered at almost any point on the continent within 24 hours from the time it had crossed the English Channel. Mail addressed to Berlin reached Plymouth in from six to seven days after leaving New York and was in Berlin 30 hours later. Now it takes from 10 to 12 days for the mail to reach Rotterdam and as much as 14 days to reach Christiania or Copenhagen, with an additional period of from 24 to 36 hours for forwarding to Berlin. Formerly practically all of Europe received at least four mails a week from this country. Now there is an average of two mail shipments a week to Plymouth, while Germany is receiving from four to six mail shipments a month.

## UNUSUAL PICTURE OF NAVAL-PAGEANT THRONGS



AFTER the recent naval pageant on the Hudson River, thousands of persons crowded the sea wall in front of Battery Park in Lower New York to see the American fleet as it steamed past the "Mayflower," the presidential yacht, and made its way out into the Atlantic to participate in the marine war game. The accompanying photograph was taken from the top of a Manhattan Island building and shows the crowds thronged about the old Battery, which now houses the New York aquarium.

Both the Buyer and the Seller of a Used Motor Car are Benefited by the Open-Air Mart

## USED MOTOR CARS ARE SOLD IN PUBLIC MARKET

In one of the western cities a distinctly new institution, an open-air public market for used motor cars, has made its appearance. The purpose back of the plan is to eliminate the commissions paid to selling agents under the customary method of making such transactions. In this case the owner pays $2.50 a week for the privilege of parking his machine in the mart. It is then continually on display and will be demonstrated to prospective purchasers by attendants without additional cost to the owner. Motorcycles are handled in the same way, although at a lower rate. The purchaser of a car is able to deal with the proprietor of the market, if he desires, or may negotiate directly with the owner. In this way both the owner and the purchaser of a car are benefited.

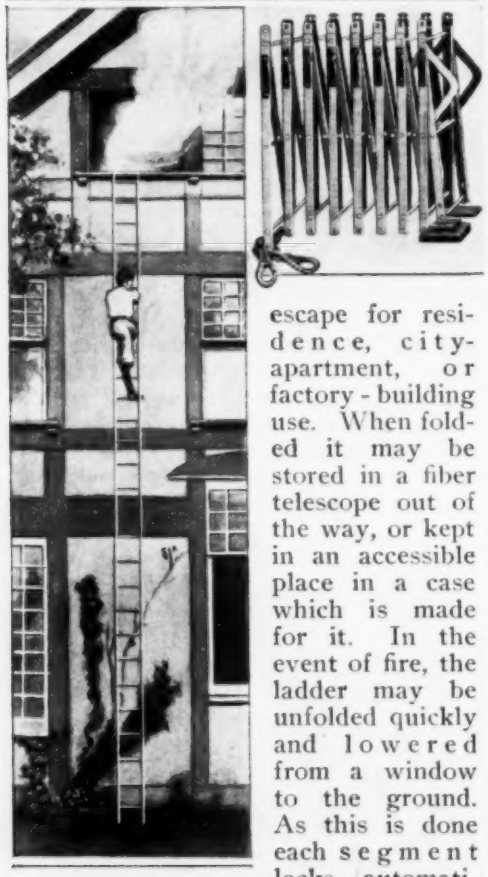
## WALKING MACHINE DESIGNED FOR INDOOR EXERCISE

To make it possible to take long walks even on unpleasant days when the weather does not permit her leaving the hotel, a treadmill walking machine has been constructed for a prima donna who carries out a daily program of exercises in an attempt to ward off obesity. The machine is placed in one of the rooms of her suite where she uses it when an outdoor walk would not be agreeable. Attached to it is a meter which indicates the mileage traveled and enables her to keep account of the distance walked at different times during the day.

This Machine Makes It Possible for a Prominent Opera Singer to Take Long Walks in Her Own Apartment When the Weather Prohibits Outdoor Exercise

## FOLDING FIRE ESCAPE MADE FOR RESIDENCE USE

Made light and compact so that it is readily portable, a folding steel ladder has been designed as an emergency fire escape for residence, city-apartment, or factory-building use. When folded it may be stored in a fiber telescope out of the way, or kept in an accessible place in a case which is made for it. In the event of fire, the ladder may be unfolded quickly and lowered from a window to the ground. As this is done each segment locks automatically with the straightening of the ladder, so that it is held with a certain rigidity. At the same time it has the advantage of flexibility so that it may be used over a mansard roof, or the top of an intervening porch, for instance, without difficulty. Although light enough in weight so that it may be carried to a window and dropped by the average woman, it is sufficiently strong to support as many persons as can conveniently use it at one time. A third-story ladder of this type weighs about 40 pounds.



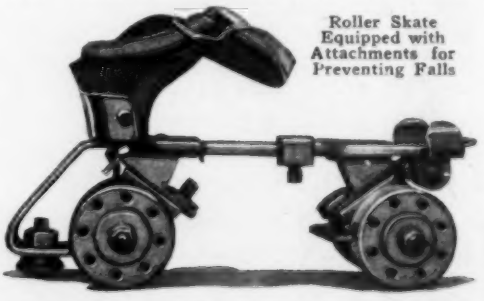
Folding Steel Ladder Designed as a Fire Escape for the Home

## BIG FLAGSTAFF FOR LONDON BOTANICAL GARDEN

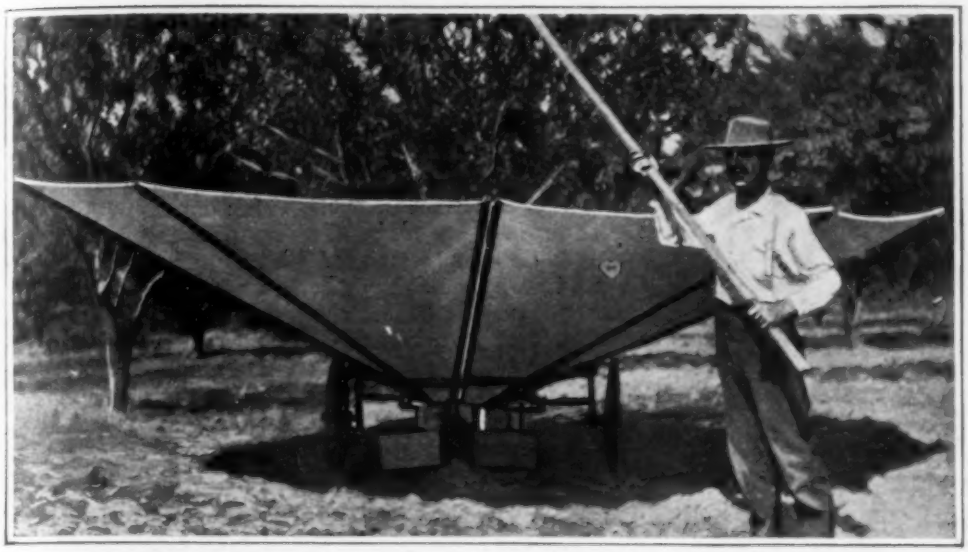
A flagstaff, 216 ft. long, has been made at Vancouver, British Columbia, and is to be shipped to England, where it will be erected in the Kew Botanical Gardens, a few miles out of London. The tree from which it was made was a perfect specimen of fir pine and the staff is straight and without flaw or defect. It is 32 in. square at the butt, tapering to a diameter of 12 in. at the top. The flagstaff will make a deck load for one of the big liners running out of Vancouver. It is said to be the longest flagstaff ever produced from the forests of British Columbia.

## ROLLER SKATE WITH SAFETY ATTACHMENTS

A roller skate that is practically accident-proof has been invented for preventing the bad falls that often occur through overconfidence or lack of skill in beginners. At the back of the skate is a steel bracket carrying an adjustable bearing plate. The bearing plate consists simply of a special head on a bolt and is easily adjusted for height with washers, as shown. In case the skate starts to fly out forward this plate comes down on the pavement or floor, stops the movement, and gives the skater a chance to recover equilibrium. As an additional precaution there is placed at the back of the forward rollers a small friction device that instantly binds the wheels at the slightest backward motion, but is inoperative so long as the skate moves forward.



Roller Skate Equipped with Attachments for Preventing Falls



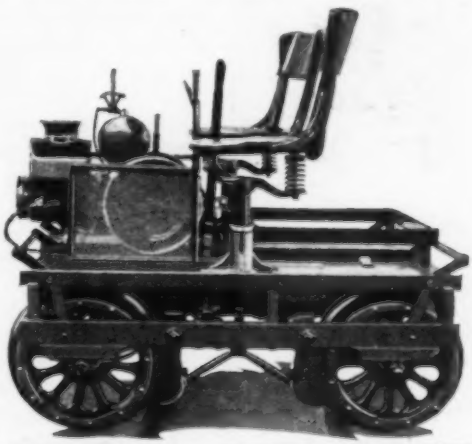
The Frame of the Apron Enables the Device to be Placed about the Trunk of a Tree

## FRUIT-GATHERING DEVICE RESEMBLES UMBRELLA

To simplify the work of gathering fruit which does not necessarily require hand picking, a canvas-apron device has been invented which in appearance is similar to a large umbrella. It is so arranged that it may be placed about the trunk of a tree, forming a funnel into which apples or oranges are caught as a tree is shaken. In the center of the device is a cloth arranged in such manner as to break the fall of the fruit as it rolls into the chutes and is discharged in baskets or boxes placed on the ground. The canvas is supported by radial arms which may be folded over on one side to permit the device, which is mounted on a cart, to be wheeled between the various rows of trees in an orchard.

## MOTOR-DRIVEN RAIL CAR FOR TRACK INSPECTION

Quite a novel-appearing motor-propelled car for the use of roadmasters engaged in railway-track inspection has recently been developed. It is equipped with a light, two-cycle, 4-hp. engine which is capable of driving it at a speed of from 3 to 40 miles an hour in either a forward or backward direction, which eliminates the necessity of turning the car around when the course of travel is reversed. The motor is of a simple type which is easily kept in running order. The wheel base of the machine is short and the weight light, so that it may be carried in a baggage car and received or deposited at a station without especial difficulty. Instead of the usual bench seat, the car is equipped with two swivel chairs which may readily be faced toward either end.



Track-Inspection Car Which may be Driven in Either Direction Equally Well

## STREET CLOCK PLACED HIGH ON CORNER OF BUILDING

In placing a large double-faced clock on a Los Angeles building, the usual practice of employing brackets to support it over the sidewalk was discarded and the dials were put on adjacent sides of the corner column of the structure between the fourth and fifth floors. The reason for placing it at this rather unusual height was the belief that at such a point it could be readily seen by more persons than if it were set closer to the street level.

The faces of the clock are 5 ft. in diameter, while its finish is made to harmonize with that of the building, which is constructed of light-colored brick.

## COMBUSTION OF COAL AIDED BY PULVERIZING IT

Certain fuel authorities are advocating that for railway and industrial purposes in large cities, coal should be ground into a fine powder and shot into furnaces under air pressure instead of being used as it now is. By so doing, it is claimed, there is less waste of energy because the combustion is more complete. Another advantage of almost equal importance is that the smoke nuisance is materially lessened. For railway purposes the coal is ground, dried, and kept in an air-tight tank on the tender, in much the same way as oil is carried when used for fuel. It is forced into the fire box under pressure, exploding to the formation of gas without lowering the temperature or adding moisture. More than $200,000,000 is expended annually by railroad companies for coal, and it is estimated that by using this system of firing, the saving would be tremendous. Although the plan has been advanced at Chicago as a solution of the smoke problem and a substitute for the electrification of the railway terminals, there is considerable dispute about its value in the latter case.

## HANDY ATTACHMENT FOR GOLF CLUB

A true "lazy-man's device" is now being introduced for the convenience of golfers. This device consists simply of a metal clip mounted on the handle of a golf club and so shaped that the player can pick up or tee the ball without having to stoop.

¶An exhaustive agricultural atlas of the United States is being prepared by the government. Pending its completion, a smaller work of approximately 100 pages of maps, text, and diagrams is to be issued dealing with relief, soils, climate, crops, rural population, live-stock distribution, and the size and value of farms.

Two Bridges of Different Periods Which Illustrate the Advance Which has been Made in Railway-Bridge Construction

## DEVELOPMENT OF RAILWAY ROADBEDS AND BRIDGES

Although the contrast is not so striking to the casual observer, the changes in roadways and track structures which have accompanied the rapid development of larger and heavier locomotives and rolling stock have been almost as great in the former as in the latter. If the original railway roadbed and trackage were to be compared with those of today, the difference would be almost as noticeable as that between Stephenson's famous "Rocket" and the new articulated compound engine of the Erie Railroad which weighs 422½ tons. The accompanying photograph shows two railway bridges which illustrate two separate periods in bridge construction. The smaller one was built in 1889, and the larger about 20 years later. If it were not that the former structure was built with nearly twice the amount of steel actually needed at the time of its erection, it would be incapable of supporting many of the trains which are now run across it.

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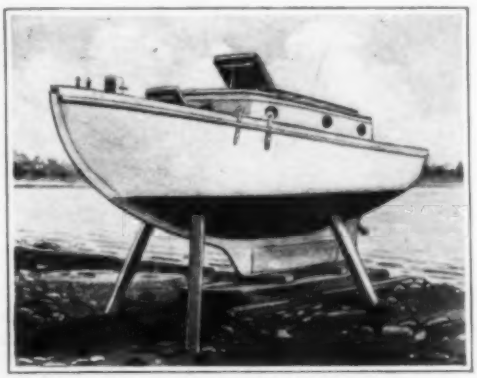
¶ Diamonds having a total value of nearly $27,000,000 were taken from the South African mines in 1914.

## CONCRETE KEELSON FOR SAILING BOAT

Concrete employed in place of lead as a material for the keel of a small sailing craft, is the somewhat unusual use found for cement by a Pennsylvania yachtsman. A concrete keelson weighing 2,200 lb. was fitted on the auxiliary yawl "Florence," a 32½-ft. boat with a 10½-ft. beam, at a cost of $25, as against an expenditure of approximately $225 if lead had been used. So far the experiment has proved successful, as the vessel has seen hard service and been aground several times, while the keelson is apparently still in good condition.



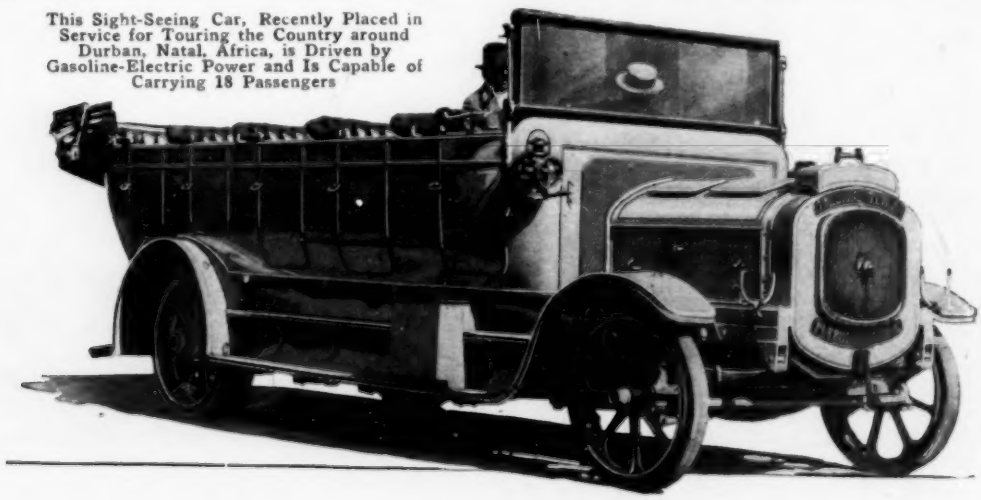
An Auxiliary Yawl with a Concrete Keelson Weighing 2,200 Pounds

## ELECTRIC SURFACING TOOL FOR CONCRETE WORK

For smoothing the surface of a concrete wall, dressing down the form marks, and providing a good base for a cement wash, an electric planing tool has been invented which operates at high speed and leaves the work dry and slightly porous. In the past this has been done chiefly by hand, a carborundum stone being employed and water used to eliminate the grit. By that method a paste is formed and rubbed into the pores, frequently with unsatisfactory after results. The new machine, instead of grinding the surface away, chips it. This is done by a cutter disk which is provided with 24 wheels, set in pairs and each having two dozen, or more, teeth which act as miniature hammers and are so directed that their edges strike the surface squarely. The disk is driven at a speed of about 2,000 revolutions a minute by a flexible shaft that extends to an incased motor strapped at the waist of the operator. The apparatus complete weighs about 20 lb., and will take either a 110 or 220-volt current. The machine also may be employed in surfacing stone.

## GASOLINE-ELECTRIC POWER FOR SIGHT-SEEING CAR

The latest development in gasoline-electric motor cars is a sight-seeing car that has just been placed in service at Durban, Natal, Africa. This kind of equipment, while not new, is still uncommon. It is being used to a limited extent on interurban cars and on at least one automobile, which was described in a recent number of this magazine. Its application to a sight-seeing car capable of carrying 18 passengers, such as the one at Durban, is believed to be new. In this car a 40-hp. internal-combustion engine is used to drive an electric generator from which the power both for driving and for lighting the car is taken. The car is to be used for touring the country around Durban, where some of the finest scenery in South Africa is to be found.



**This Sight-Seeing Car, Recently Placed in Service for Touring the Country around Durban, Natal, Africa, is Driven by Gasoline-Electric Power and Is Capable of Carrying 18 Passengers**

Two-Ton Rock Hurled against Dwelling House by a Heavy Blasting Charge: Part of This Rock Went through the House, Taking the Breakfast Table with It

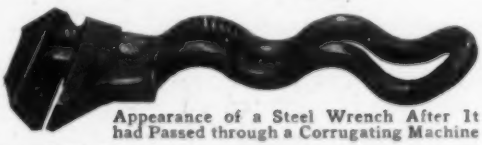
## BLASTING CHARGE BOMBARDS DWELLING HOUSE

A dwelling house in Manyunk, Pa., was almost wrecked and the inmates narrowly escaped death from the bombardment of stones that resulted from the firing of a heavy charge in connection with blasting operations in the outskirts of that city. One two-ton rock was hurled against the house, making an enormous hole in the wall, and part of the rock crashed entirely through the house into the yard beyond. This rock demolished the table at which the family was eating breakfast, but without injuring any member of the family.

Another rock tore away part of the cornice and crashed through the roof, seriously injuring one of the family asleep in an upstairs bedroom and wrecking most of the furniture.

## CORRUGATING A STEEL WRENCH

Through some oversight a steel wrench was left in a pack of sheets which were to be corrugated, and was passed through the corrugating machine. Although the pack of sheets alone was all that the machine was guaranteed to handle, a perfect 2½-in. corrugation was put into the wrench, and, according to reports, without any injury to the machine or dies. The

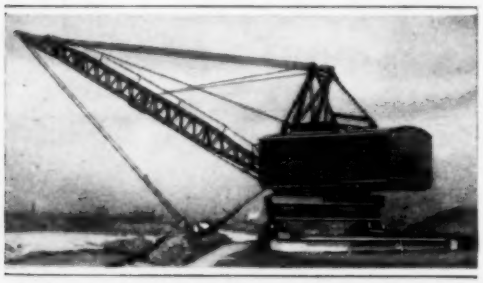


Appearance of a Steel Wrench After It had Passed through a Corrugating Machine

handle of the wrench is made of two ½-in. round steel bars, while the jaws are of steel ⅝ in. thick. It is no longer of any value as a wrench.

## BIG ELECTRIC DRAG-LINE EXCAVATOR

What is said to be the largest electric drag-line excavator in the world is being used in excavating the Calumet-



This Machine, Used in Drainage-Channel Excavation, is Said to be the Largest Electric Drag-Line Excavator in the World

Sag Canal, an important drainage channel near Chicago. This machine weighs about 225 tons and has a steel boom 125 ft. long. The bucket is designed to hold 3½ cu. yd., but can easily be made to hold 4 cu. yd., when the material is heaped up. The machine is both operated and propelled by electric current taken from the wires of a public-service corporation and first passed through a transformer wagon which steps the current down from 2,000 volts to 440 volts. One of the ingenious features of the equipment is the sectional track on which the excavator runs. Each of these sections is made up of heavy structural-steel shapes and is curved so that the outer rail is 12 ft. long and the inner rail 8 ft. long, each section being 30 ft. wide. In going around a curve the sections are assembled long side to long side, but in working on a straight section of the canal the sections are jointed so that the 8-ft. section of one abuts against the 12-ft. section of the other. As the sections are short, the curvature in each is slight, and with the sides so alternated the machine travels practically in a straight line.

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¶The toothbrush has been condemned as a dangerous instrument which should be abandoned. Its sterilization is claimed impossible and its effect detrimental. Use of dental floss and the massaging and cleaning of the gums and teeth with the forefinger is advocated.

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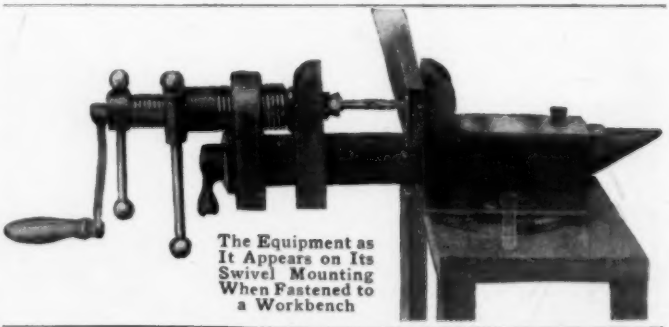
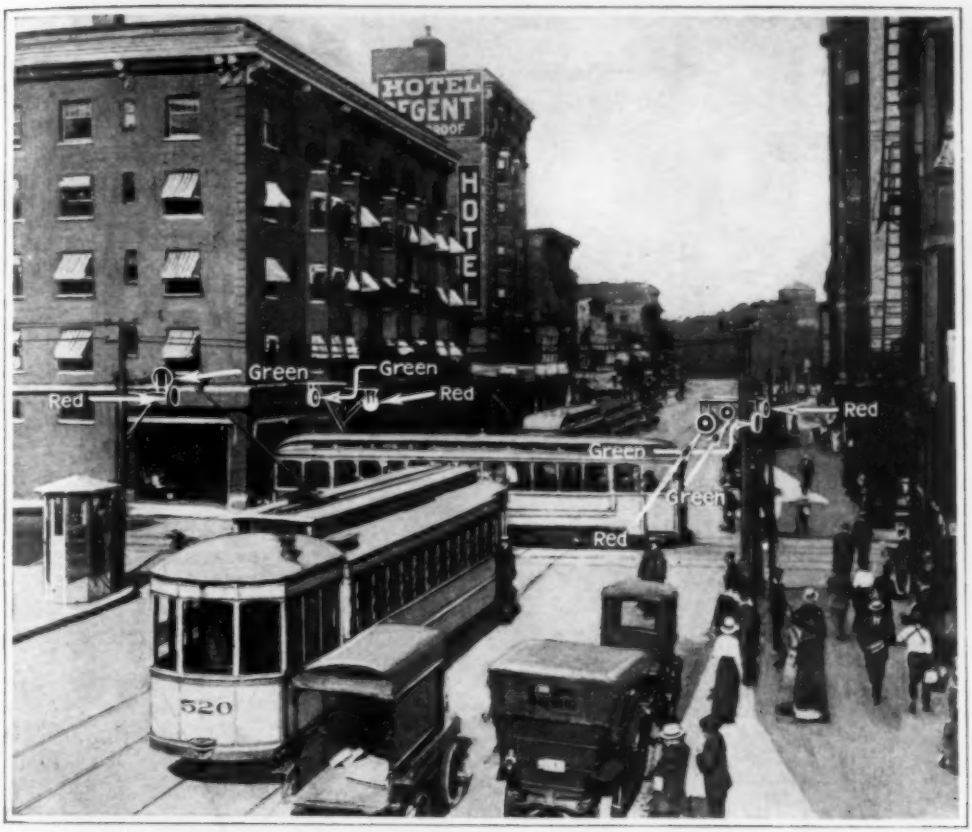
## MACHINE-SHOP EQUIPMENT FOR MOTOR-CAR OWNER

Combining a number of different instruments in one compact piece, a serviceable tool for the private garage in which the owner of a car does much of his own repair work, has lately been brought out. It consists principally of a multi-vise and drill press built together. Coupled with these are an adequate anvil and a tool-steel cutting hardy. The apparatus is mounted on a swivel base so that it may be turned freely or set in various working positions. A vise with quick-acting jaws is afforded which operates independently of the drill press, making it unnecessary to feed the vise jaws when feeding the drill. Any-size hole may be bored as accurately, it is claimed, as if the work were done in an average lathe. With its mounting, the tool weighs approx-



The Equipment as It Appears on Its Swivel Mounting When Fastened to a Workbench

imately 60 pounds. The swiveling feature is particularly valuable when working long pieces in a small place.




With This Crossing-Signal System, Installed at Cleveland, Ohio, the Traffic is Controlled Entirely by the Red and Green Lights; the Crossing Officer is Stationed in the Booth at the Left

## ELECTRIC-CONTROL SYSTEM FOR CROSSING TRAFFIC

A new control system for crossing traffic, that has been installed in Cleveland, Ohio, is designed to give unmistakable indications to approaching vehicles and to do away with the possibility of conflicting signals. Electric lights, facing oncoming vehicles and hid from view in the opposite direction, are placed on the right-hand side of each street. A red light denotes "Stop" and a green light "Proceed." The red light is placed on the near side of the intersecting street and the green light on the farther side. All these lights are controlled by switches placed in the officer's booth, and are so interlocked that when the green light is given for one route the red light automatically goes on for the other route. To clear the crossing in case of fire, the officer simply throws an emergency switch which sounds an alarm bell and turns on the red lights at all the corners, instantly stopping traffic from all directions.

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## A MYSTERIOUS MENACE IN RAILROAD OPERATION

Transverse fissures that begin apparently with a nucleus formed at the time the rail is rolled and gradually spread as the rail is subjected to the strain of traffic constitute one of the most puzzling problems with which railroads and the makers of rails have to deal. Faults of this kind, which are usually hidden inside the metal beyond the possibility of detection by the keenest inspector, seem to be characteristic

of the open-hearth steel now generally used for making rails. They have been likened to "cancer spots" which start with a point of infection and eat

Rails That Broke as the Result of Transverse Fissures: The Nucleus from Which the Fault Spread in All Directions can be Seen in Each of the Rails

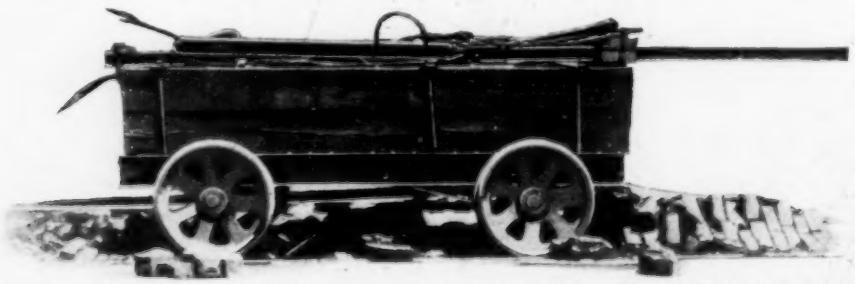
through the heart of the metal. This term may or may not properly describe the process. Rail experts are inclined to believe that the trouble is caused not by any deterioration of the metal, but is the result of the mechanical development of a crack that starts from a weak point originally in the rail. Such faults have been under investigation by rail experts for several years, but neither the cause nor the cure for the trouble has yet been found.

## STEEL TAPE FOR MEASURING HELL GATE SPAN

For checking the locations of the ends of the span by direct measurement after they had been established by triangulation, the engineers in charge of the Hell Gate arch bridge now being built to connect New York City with Long Island used a steel tape 1,050 ft. long. The span of the main arch is 977½ ft. between centers of end pins, and at the time the measurement was made the towers had been built up to the level of the roadway. A wire was stretched between the towers, and one end of the tape was then attached to the wire and pulled across to the opposite tower. The tape hung free between end supports and was subjected to a pull of about 71 lb. while the measurement was being made. The tape is 1/32 in. thick and 3/32 in. wide, and was specially made for this measurement.

## PAVEMENT PLOW TIMESAVER FOR TRACTION COMPANY

For the purpose of removing granite block, or similar, pavements preliminary to relaying street-car tracks on paved thoroughfares, a plow has been devised by a traction company in Cleveland which accomplishes the work of approximately 500 laborers. The plow weighs 3,500 lb., has a cast-steel prow, 10 ft. in length, and is mounted on trucks which are weighted down by eight tons of scrap-iron ballast. A heavy cable connects it with a service



Pavement Plow Used by a Surface-Traction Company Which is Said to Do the Work of 500 Laborers

MOTORISTS ATTENTION!
YOU ARE ON YOUR HONOR
FRESNO COUNTY HAS NO SPEED COPS
DRIVE SO THEY WILL NOT BE NEEDED
SPEED LIMIT 30 MILES PER HOUR = Board of Supervisors

**A Signboard Which Fresno County, California, has Found More Effective Than Motor Police in Minimizing Speeding on Its Highways**

car, driven by four motors, which is used to draw it. In addition to a motorman and trolleyman, only two men are required in operating the apparatus, which turns up the pavement blocks with apparently the same ease that an ordinary plow cuts through soft loam. In two or three hours' time the device can open up enough trackage to keep a rail gang busy for a week. It is claimed by the company that on one occasion the plow succeeded in tearing up the pavement along a 4,500-ft. stretch of track in 28 minutes.

## MOTORISTS PUT ON HONOR IN CALIFORNIA COUNTY

Fresno County in California has taken an interesting step in dealing with the motorists who use its highways. It has adopted a policy of placing every driver completely on his honor and then not employing speed patrolmen to trail cars and arrest violators of the road rules. At one side of each of the various highways entering the county a large signboard has been erected which informs all foreign motorists of the "honor system," of the absence of "speed cops," and that the speed limit is set at 30 miles an hour. This plan has been in force for some weeks and, as might be expected, has served its purpose admirably. As a result a movement is now being promoted to obtain the removal of motor police in all of the San Joaquin Valley counties, so that motor tourists using the valley route between San Francisco and Los Angeles will be controlled solely by the honor system.

## SWITCHING SIGNALS GIVEN WITH AUTO HORNS

Ten electric automobile horns mounted on telegraph poles and all controlled by one push button in the scale house are used for signaling the switching crew in handling trains over the railroad switching "hump" at Inman, Ga. Signals given by these horns take the place of signaling by hand and are said to give much better results, especially at night or in foggy weather. The switchmen can move about at will without the necessity of continually watching for signals, while the whole crew of a long train is certain to get the same signal at the same time, in unmistakable if raucous tones, from the horns spaced along the track on the telegraph poles.

# ATTRACTIVE GARAGES AT MODERATE COSTS

By ALBERT MARPLE

IN designing private garages for family motor cars, the attempt to procure architectural harmony between them and the dwellings, as well as other adjacent buildings on residential grounds, is becoming more and more general. The remarkably rapid development of the automobile industry, which quite naturally caused stables to be remodeled and rough housings to be erected without much thought being given to other than their utilitarian side, has been largely responsible for the backwardness manifested in this particular.

As new homes have been constructed, however, more attention has been paid to the exterior appearance of garages, and of late this has often shown itself to be true even in the case

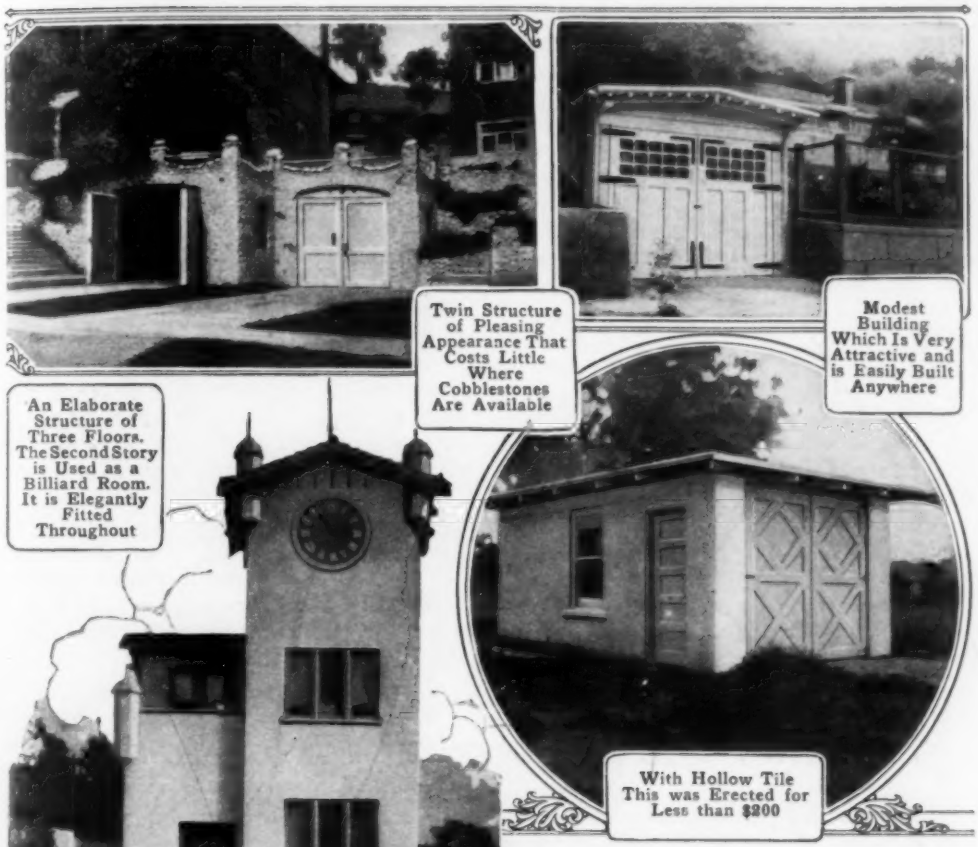
This Garage, Which Has Room for Four Machines, is Fitted with Sleeping Quarters on Second Floor

A Pergola before the Entrance of a Garage Usually Adds Much to Its Appearance and may be Built Inexpensively

This Shingled Housing, Accommodating One Car, can be Built for a Very Moderate Price in Nearly Any Locality

With Space for Four Cars and Sleeping Rooms, This Structure Cost Only $600

Building a Housing in a Side of a Hill Solves the Problem in Many Places Where Natural Surroundings Permit



Twin Structure of Pleasing Appearance That Costs Little Where Cobblestones Are Available

Modest Building Which Is Very Attractive and is Easily Built Anywhere

An Elaborate Structure of Three Floors. The Second Story is Used as a Billiard Room. It is Elegantly Fitted Throughout

With Hollow Tile This was Erected for Less than $200

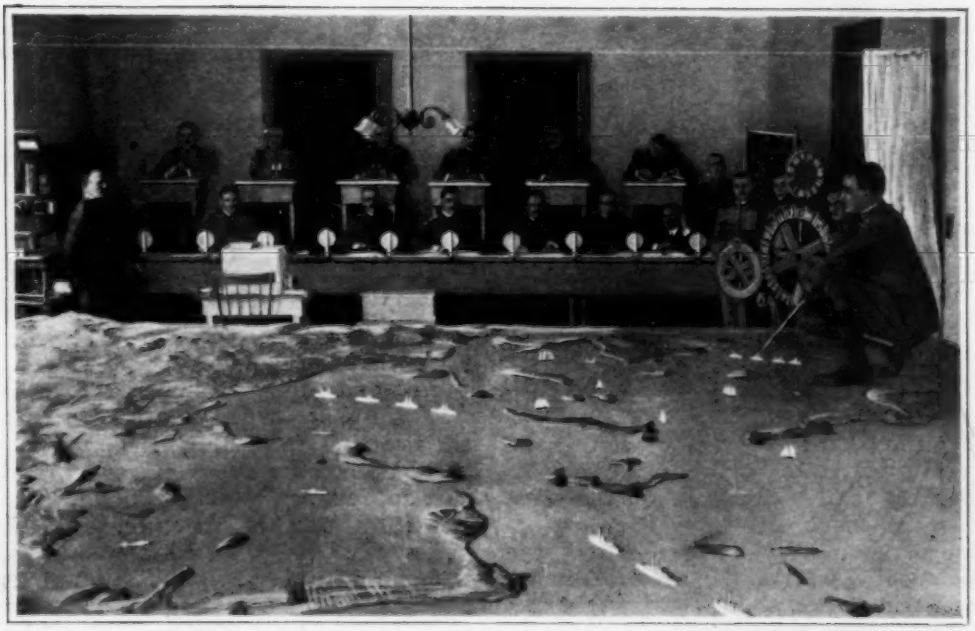
of the least expensive structures. While there are hundreds of examples of elegant housings built on the same lines as the homes to which they belong, most of which are out of the financial reach of the average owner of a small car, there are probably as many others, representing modest investments, which fit their surroundings with equal taste.

The cost of erecting the garages shown in the accompanying illustrations varied from approximately $150 to $4,000, although the latter figure is an excessive one. The buildings were designed to meet the needs of the respective owners and at the same time harmonize with the residences. In each instance the flooring is of cement and has provisions for draining it properly. The shingled garage, which is shown, is 16 by 18 ft. in size, is provided with six windows furnishing an abundance of light, has a cement driveway, and cost approximately $150 to build. The exterior of another structure, in which hollow tile has been used for the walls, is finished in plaster. The eaves of its nearly flat roof overhang about a foot and a half. In size the garage is 14 by 16 ft., while the expense of erecting it amounted to about $175.

One garage, which could easily be reproduced on grounds where there are hills, is built into a side of a knoll. It is formed much like a vault, with concrete walls 6 in. in thickness and a reinforced roof. It measures 11 by 16 ft. and cost $200. An artistic twin garage built of cobblestones and placed between two residences at the front of the property, but on a lower level, cost $300 each to construct. On either side are broad steps extending over the terrace above. The driveways are separated. The walls, which are approximately a foot in thickness, are reinforced with steel rods. A concrete garage which could be duplicated in most localities for about $300 is shown at the right of these double houses. It is unusually pleasing in appearance, has an abundance of small-paned windows, and is 12 by 18 ft. in dimensions.

A large structure capable of accommodating four cars and provided with living quarters for servants on the second floor, can be built with reinforced-concrete walls for about $600. The floor measures 24 by 34 ft. and the roof is made of red tile. Access to the upper story is gained by a stairway on the outside. Another structure which is especially effective is built with overhanging eaves and a broad, vine-covered pergola which extends over the approach. The brickwork here harmonizes with the bungalow, which is of similar architecture. A three-story building of rather odd design is made of reinforced concrete and elaborately fitted on the interior. The cars are kept on the first floor, the second story is used as a billiard room, and the chauffeur's quarters occupy the top rooms. On the front of the building is a large clock equipped with chimes which ring every half hour. Although $4,000 was expended on the structure, it could be built for considerably less if fitted in the customary manner, and still be equally serviceable.

## STUDYING THE DEFENSE OF BOSTON HARBOR



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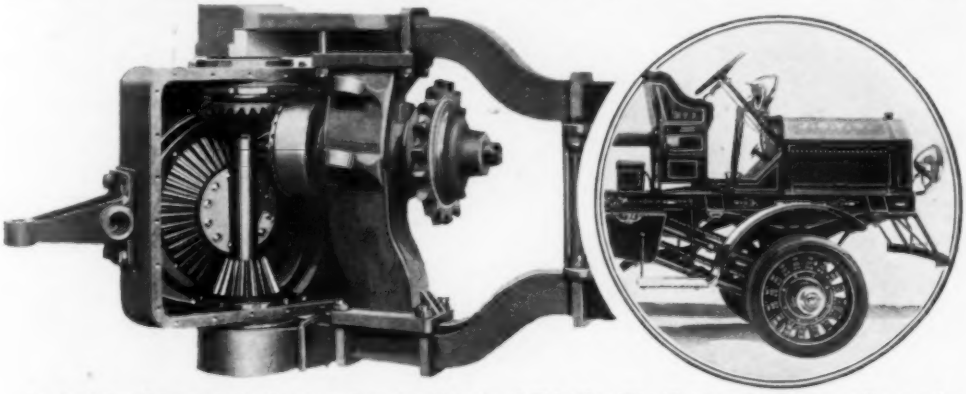
COAST-ARTILLERY officers have to master harbor-defense problems as carefully as the Navy does. The officers shown here are studying Boston Harbor and trying to find a flaw in its fortifications that would permit a hostile ship to enter.

## MOTOR-DRIVEN FIRE ENGINE WITH FIXED AXLES

In designing a new motor-driven fire engine a New York inventor has departed from the established plan in automobile construction of applying power to the rear axle and has devised a means of transmitting it to the forward wheels. This, figuratively, separates the vehicle into two distinct parts, the front, or motor-truck section, and the rear, or fire-engine part, which is essentially no different from the corresponding part of the ordinary fire engine of the horse-drawn type. The plan of placing the drive chains on the front wheels involves the invention of a mounting that enables the latter members to be swung about substantially vertical axes adjacent to the outer ends of immovable axles. As may be readily seen by the accompanying photograph, one of the driving chains extends from the propulsion shaft to the gear end of a short transmission shaft, mounted in the extremity of the fixed axle, the other end of which meshes with gears in the pivoted bearing-block housing which provides a solid support for the wheel hub and at the same time allows it to be turned freely, independent of the axle, which is fixed rigidly to the chassis.



In Applying Power to the Front, or Steering, Wheels of This New Fire Engine, the Designer Invented a Mounting Which Allows the Wheels to be Swung While the Axle is Fixed Rigidly to the Chassis

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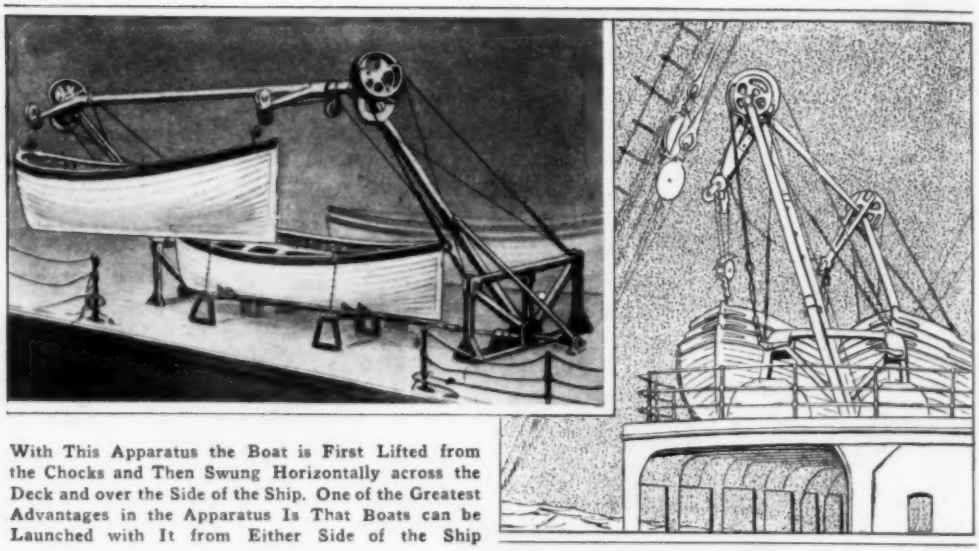
¶The total value of fish caught in Canadian waters in 1914 was $33,207,748.

## PORCH LAMP PLACED INSIDE OF BUILDING

A porch lamp of a new type, just placed on the market, is made to be installed inside the building so that it is not only protected from the weather but serves to illuminate the hall or front room as well as the porch. The lamp is mounted inside the wall adjacent to the porch. Part of the light is diffused through the room, while a part of the horizontal rays are transmitted through a 1¼-in. tube to a globe mounted on the outside of the wall, where, with the aid of a reflector, it is uniformly distributed over the porch. The lamp is adapted to other purposes as well, such, for example, as the lighting of clothes closets.

Some of the Horizontal Rays from This Lamp Pass through the Tube to the Globe Outside, Illuminating the Porch as Well as the Hall



With This Apparatus the Boat is First Lifted from the Chocks and Then Swung Horizontally across the Deck and over the Side of the Ship. One of the Greatest Advantages in the Apparatus Is That Boats can be Launched with It from Either Side of the Ship

## RAPID BOAT-LAUNCHING APPARATUS

To nest boats entirely across any convenient part of the deck and then launch them rapidly with a single pair of davits, is the purpose of a new boat-launching apparatus that has already been installed for test on two seagoing vessels. The novel feature about this apparatus is that the boat is first lifted from the chocks and then swung horizontally over the deck and beyond the side of the ship. This is accomplished by two arms that are fixed to a horizontal shaft extending between the tops of the pair of davits. These arms hang vertically as long as the davits are in a vertical position, but swing out horizontally through the action of lines passing over eccentric sheaves as the davits are swung to an inclined position. The arms carry the lifting lines, and the davits are spaced a sufficient distance apart to permit the boats to swing clear between them.

## SNOW-CLAD MOUNTAIN PEAK FOREST-LOOKOUT POINT

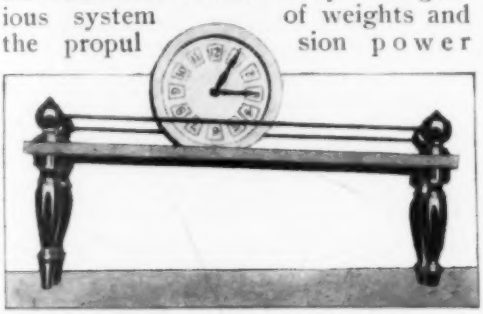
One of the important lookout stations used by rangers in the west throughout the summer when a careful vigil is maintained for forest fires, is the summit of Lone Mountain, on the divide between the Gallatin and Madison rivers in southwestern Montana. This peak, although snow-covered much of the season, is the home of a lookout from July to October. It has

From This Peak Seven Different Forest Preserves are Watched during the Season When Forest Fires Are Prevalent

an altitude of more than 11,000 ft. and furnishes a vantage point from which seven different forest preserves in Montana, Wyoming, and Idaho can be watched through binoculars. Telephone connections are maintained with the several forests, so that rangers may be notified the moment a fire is discovered.

## INGENIOUS GRAVITY CLOCK REQUIRES NO WINDING

Designed so that it does not require winding, a novel clock which is said to keep very accurate time has recently been invented by a Californian. Its mechanism is controlled by an ingenious system of weights and the propulsion power

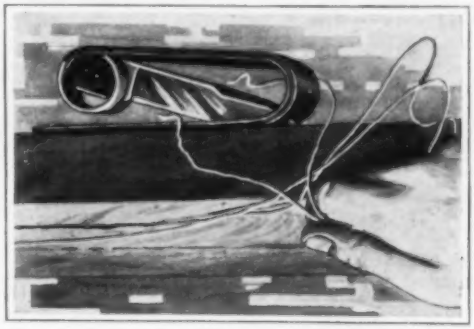


Curious Rolling Clock Which Has No Springs and does Not Require Winding

gained by allowing the instrument to roll slowly down an 18-in. incline. This short journey is completed in 30 days, when, instead of being wound, the clock is returned to the top of the incline. The cylindrical case of the instrument revolves while the dial remains in its normal position with the figure 12 at the top. The hands are moved and the rolling of the clock controlled by the arrangement of weights in the interior of the case.

## SIMPLE CORD CUTTER WITH GUARDED BLADE

In a simple cord cutter that has just been invented and patented the knife blade is held in a sloping position, with the edge down, by a curved arm that is made of the proper shape and width to serve as an effective guard. The cutter is designed to be permanently mounted on a counter or table. All that is necessary for mounting it is to sink the end



How the New Cord-Cutting Device is Used

of the blade into the wood until the lower part of the guard rests on the counter top and then secure it with a single screw.

## DESK FOR CRAMPED OFFICE SEATS TWO PERSONS

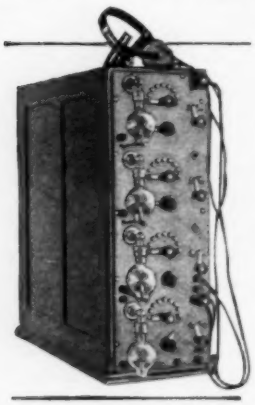
Among the new fixtures which are being introduced for offices is a flat-top desk designed for the use of two persons. It is intended particularly for offices in which space is limited, and takes up no more room than an ordinary single desk. The two long sides are made alike, each with three drawers and adequate knee space. The drawers on one side, however, are opposite the knee space on the other side, which allows the two occupants of the

Two Persons may Work Comfortably at This Desk, Which is Designed for Offices with Limited Floor Space

desk to work at different ends. It is 60 in. in length and 34 in. wide, while the drawers are 26 in. long and 14 in. wide.

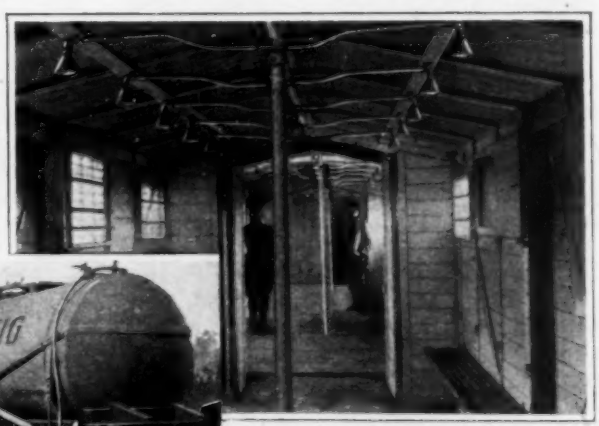
## INTENSIFY RADIO IMPULSES WITH NEW INSTRUMENT

By an ingenious combination of detectors of the "audion" type, an instrument has been devised for increasing the strength of radio impulses, at a receiving station, to as much as 600 times their original intensity. One of these detectors resembles a low-power electric lamp within which are parallel metallic plates with an incandescent filament between them. The action of the heated air between these plates rectifies and strengthens the incoming signals. When a second bulb is placed in the circuit in a certain manner the impulses are intensified from five to ten times, while the introduction of two more bulbs causes the incoming signal to be increased from 125 to 1,000 times, the average, however, being 600 per cent. When a loud-speaking telephone is used in connection with this amplifier, signals which could hardly be recorded by an ordinary detector can be heard plainly across a large room. Messages from stations in Germany, Honolulu, and other distant points, have been picked up at New York by the instrument. As an illustration of its sensitiveness, an experiment was made in which it was used as a stethoscope. The result was that the beating of a human heart resembled thunder crashes, while the sound of normal breathing was highly intensified.



## BATH TRAINS CONSTRUCTED FOR GERMAN TROOPS

One of the most serious situations which invariably faces an army in the field is the lack of proper bathing facilities for the men. Until very recently this has been particularly true in nearly all the war camps of Europe. Of late, however, a step has been taken by the Germans which apparently will go far in ameliorating the insanitary conditions which have heretofore prevailed. This has come in the construction of bath-house trains which before the opening of summer were sent into districts occupied by the enemy in northern France. These trains consist of an engine and tender, a large tank car carrying water, and a number of cars



Shower Facilities in Cars Intended for Privates. The Officers' Compartments are Provided with Tubs and Dressing Rooms

Exterior of One of the German Bath Trains Recently Sent into Northern France for the Benefit of the Kaiser's Forces

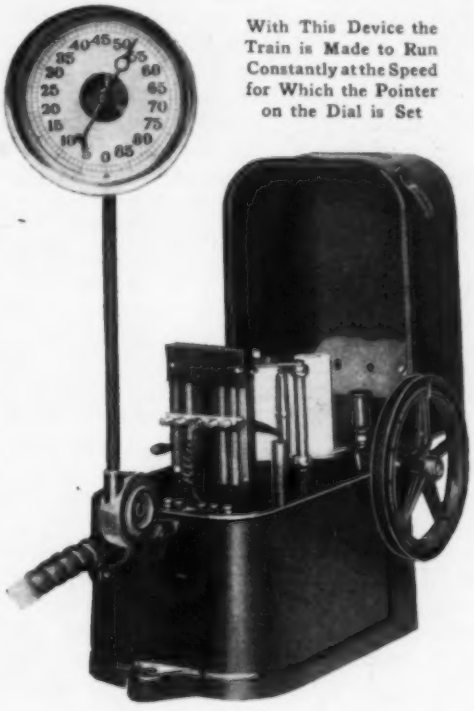
fitted with shower baths, together with others provided with tubs and lockers as well as dressing rooms for the officers. Sufficient water can be carried in one of these tanks, which is similar to those used in transporting oil, for approximately 1,000 persons.

## SCALE DEPOSIT IN BOILERS PREVENTED BY ZINC

European engineers have found a use for zinc which is comparatively unknown in this country. It consists of employing it as a means of preventing foam and the deposit of scale in boilers. Plates of pure zinc, 6 in. long, 4 in. wide, and ½ in. thick, each with a ½-in. hole punched through the center, are being shipped abroad in large quantities. In using these, a steel rod is passed through a side of a boiler and the plates, separated by steel or iron washers, are strung on it. The zinc and iron members are constantly in contact and form a bar extending across a boiler, within which a galvanic current is created which prevents scale formation. This keeps a boiler clean for an indefinite period without requiring the use of chemical agents, it is asserted.

## DEVICE FOR REGULATING SPEED OF TRAIN

With an electro-mechanical device recently invented a train may be kept at a constant speed regardless of grades and curves and without the necessity for any attention on the part of the engineer. This device, which can be installed on any car of the train, or on the locomotive, is operated by a belt that runs over the car or locomotive axle. The belt works a small pump which forces oil into a cylinder with increasing velocity as the speed increases. In the cylinder is a piston that is pushed up by the oil as well as an opening through which the oil escapes at a constant rate, so that the piston rises or falls as the speed is increased or decreased. Connected with the piston are platinum points that move along silver segments of various heights corresponding to different speeds. Each of these segments is electrically connected with one of




With This Device the Train is Made to Run Constantly at the Speed for Which the Pointer on the Dial is Set

the contacts on the dial, so that a circuit is completed through a given segment when the pointer is set on the contact that corresponds to the required speed. With the throttle open the proper amount, the speed increases until it is the same as that for which the pointer is set. When the speed goes above this, the platinum point rises to an insulated section of the segment, and the circuit is broken. As long as the circuit is closed it holds up a solenoid magnet that keeps inoperative a valve in the train line. When the circuit is broken, the magnet is deënergized, the air pressure opens the valve, and a service application of the brakes is made. The brakes stay on until the platinum point lowers to the silver segment, when the circuit is again closed, the valve is closed through the energizing of the magnet, and the brakes are released.

# SEEING BULLETS FLY

By EDWARD C. CROSSMAN

OUR first experience was while shooting light loads in an 8-millimeter (about .25 in.) Mannlicher rifle at a white rock lying on a burned-over hillside across a cañon from us, and distant 300 yd. The sun shone at nearly right angles to the line of fire. The bullet had nearly dead-black for a background.

The second shot I noted a silvery streak about halfway across the gulch, curving gently down toward the stone. I kept quiet about it, put the opera glasses on the spot, and waited. The next shot there came plainly into the field of the glasses the silvery bullet—really not a bullet in appearance, but a silvery line. I traced its course clear to the stone, and called it mentally a miss before the puff of black dust corroborated me.

With the full-service load, that now used in the German army by the second-line troops, the "Landwehr," we could still see the bullet, but the time used in flight was too short to allow any mental decision as to where the missile was going to strike. The upward curve of the bullet in its flight was plain. Strangely enough, it seemed to curve far out to the right, too.

In later years we found that the big .45-caliber revolver bullets under certain conditions were easily seen, particularly with a telescope, such as is used on the target range. Here the bullet looks like a big bumblebee, hastily approaching the paper.

When the very high velocity, .22 high-power rifle came out, the lady of the family discovered that that bullet could be seen from nearly any position ahead of or back of the firer. I was firing to her right and over her head to study the noise made by the bullet, when she called back that she could see the bullet coming. I took her place and investigated. Sure enough, the bullet could be seen plainly, first a long gray stem, opening out like the petals of a flower, then the black whirling thing that represented the bullet coming in my direction.

Here the bullet is but .22 in. across, and travels at 2,800 ft. per second, about the speed of the German and American army bullets. The appearance, however, we found to come from tiny particles of tin or lead from the core, thrown off by the bullet in flight, and so we saw sort of an aureole, not the bullet itself.

The most amazing sight in our experience was the United States service bullet with its speed of 2,700 ft. per second. Here we saw the bullet itself, not flying particles. The sun was low over the eastern hills. Its rays came through a break in the ridge bordering the range, lighting up most of the course of the bullet up to the target 200 yd. away, but leaving the target and the firing point in deep shadow. The first bullet was seen by some one, and not a man present missed the strange sight later on. The appearance was a very brilliant silvery flash, as vivid and quick as a flash of lightning.

But two things are necessary to see bullets fly, a dark background, and the sun at right angles to its course. Big-gun projectiles are of course nearly always visible, and it is not hard to see a charge of shot in flight if one knows what to look for and where to stand.

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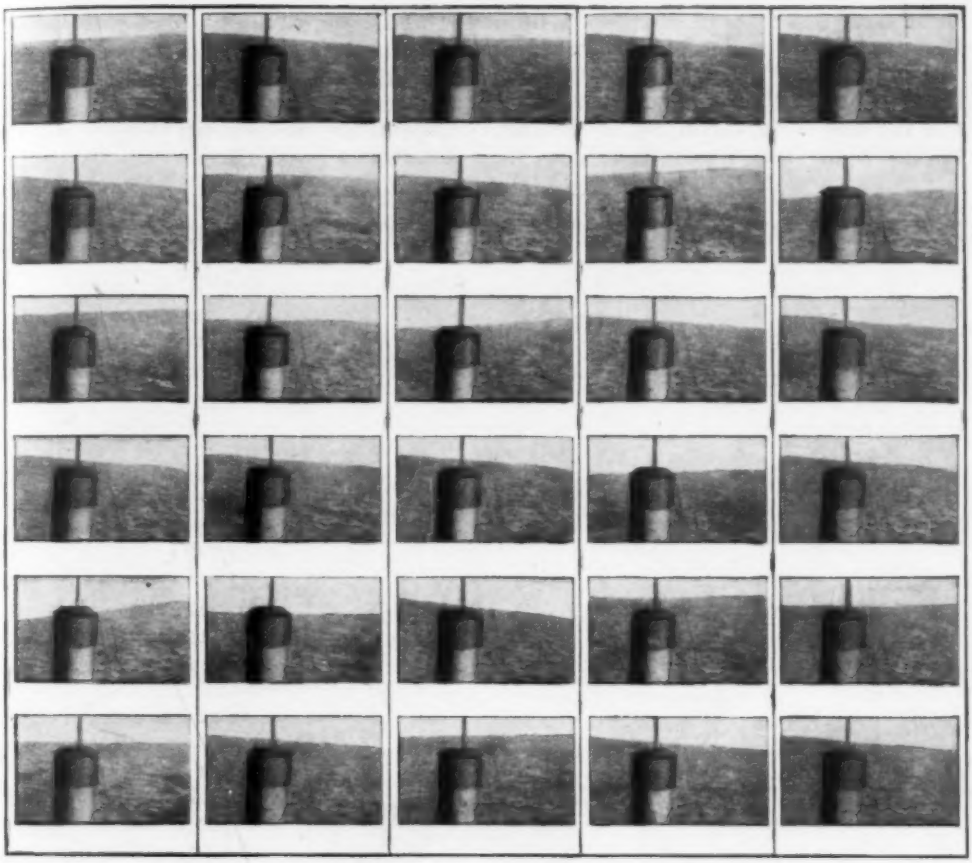
## SHIP'S SMOKE ELIMINATED BY NEW FURNACE EQUIPMENT

That the smoke from a steamship can be almost entirely eliminated has been demonstrated by tests recently carried out with the "Seneca," of the United States coast-guard service, which is provided with a new type of furnace equipment that brings about a practically perfect combustion of the coal. Photographs of the top of the funnel of this vessel taken once a minute for 60 consecutive minutes while the vessel was running at 11½ miles



These Photographs, of the Smokestack of the U. S. S. "Seneca," were Taken at Intervals of One Minute to Show the Almost Total Elimination of Smoke Brought About by the Use of a New Type of Furnace Equipment

an hour, show traces of smoke in only two or three instances. The equipment is likely to be installed on the ships of the United States Navy, since by its operation the telltale smoke by which vessels may be sighted at great distances would be lacking. In addition to the elimination of smoke, it is reported that the equipment brings about a saving of about 16 per cent in the amount of coal consumed. One of the important features is the use of shaking grate bars instead of the usual bars of the nonmovable type.

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¶One of the largest walnut-packing and cleaning establishments in the world is soon to be placed in operation in California, where over 20,000,000 lb. of walnuts are produced each year.

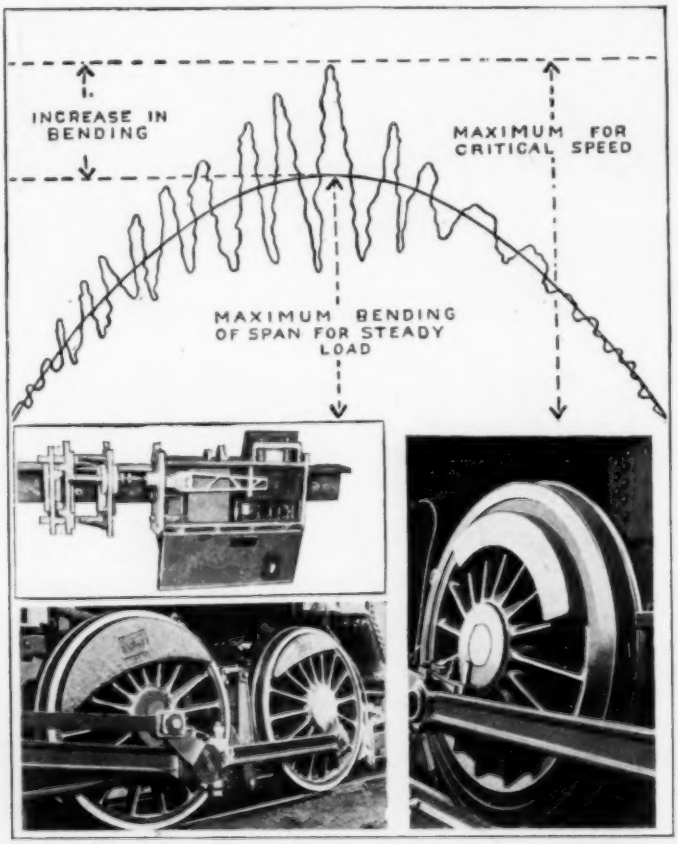
## ROOM KEPT FOR CHILDREN AT NATIONAL MUSEUM

One of the special rooms at the Smithsonian Institution at Washington inaugurated by the late Dr. Samuel Langley, is devoted exclusively to exhibits intended to interest children in natural science. Its conception grew out of its originator's realization that museums as a whole are not arranged in a way which makes them especially appealing to the minds of young children. So to offset this condition and provide a means of attracting juveniles to the institution, a children's display was prepared. All the wall cases, which contain large numbers of birds arranged in classifications designed to draw the interest of youngsters, are

built low so that everything within them is plainly visible to the youthful visitors. The "largest and smallest birds of prey," the "eagle and elf owls," and curious birds, including the toucan, umbrella bird, and others, are represented, while bright-colored and curious-shaped shells, strange insects, specimens of different minerals, fossils, and coral formations are also shown. Experience has shown that Langley's idea was a good one.

## HOW BRIDGES ARE AFFECTED BY FAST LOCOMOTIVES

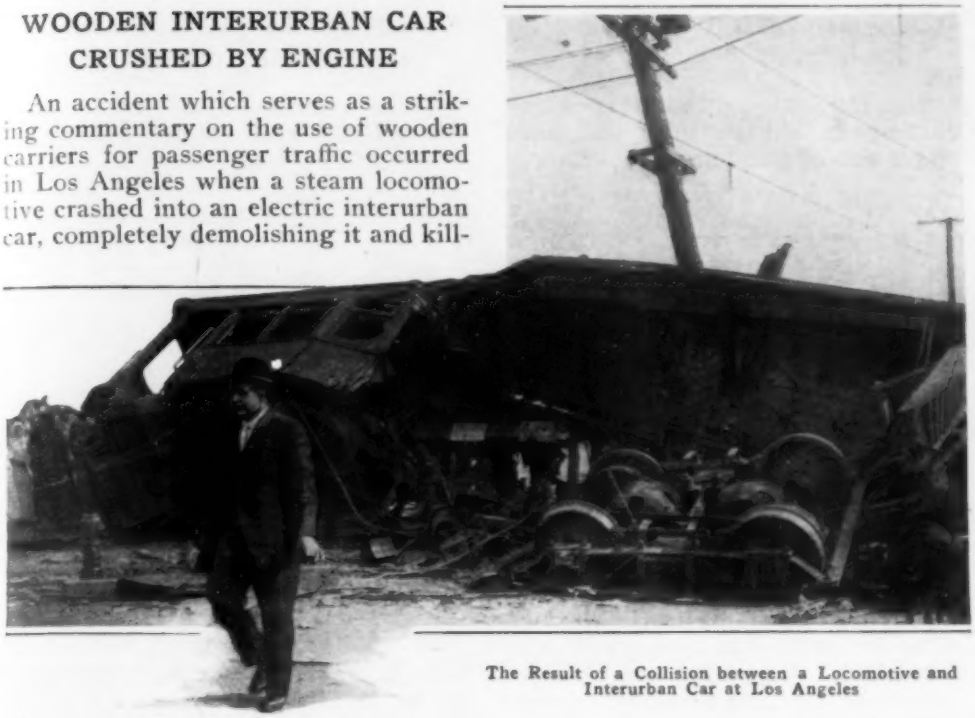
Tests recently made by an engineering association throw an interesting light on the severe vibration to which railroad bridges are subjected by locomotives running at high speed. Every locomotive drivewheel is counterbalanced to neutralize the weight of the driving rods, the counterbalancing metal being cast adjacent to the rim on the side opposite the driving-rod connection. With this arrangement it is possible to counterbalance perfectly for only one speed, so that with the locomotive running at either greater or less speed than this there is sure to be pounding. This becomes a serious matter when the locomotive is running at a speed greatly in excess of that for which its drivewheels are counterbalanced, the wheels lifting from the rails a small fraction of an inch at each revolution and then falling back with a hammer blow. Every bridge span has a natural rate of vibration, depending on its length and construction. When the pounding of the locomotive corresponds to this natural rate of vibration the result is excessive vibration, the effect being exactly like that of pushing a swing at just the right intervals. The speed at which this occurs for any particular bridge is known as its critical speed. In the case illustrated, the maximum bending of the span under the critical speed is about 50 per cent greater than that caused by a steady load of the same amount. It has been found that this effect is practically absent for speeds under 15 miles an hour and for speeds greatly in excess of the critical speed.




**The Diagram Shows the Vibration Caused in a Bridge Span by a Locomotive Running at the Critical Speed; the Pictures below the Diagram Show Typical Counterbalanced Drivewheels and the Instrument with Which the Vibrations were Measured**

## WOODEN INTERURBAN CAR CRUSHED BY ENGINE

An accident which serves as a striking commentary on the use of wooden carriers for passenger traffic occurred in Los Angeles when a steam locomotive crashed into an electric interurban car, completely demolishing it and killing six of its occupants. Although the car was reduced to little else than kindling, the engine was practically uninjured, the impact merely displacing the rear trucks and knocking the steps off the tender. The collision happened at a crossing while the locomotive was moving at a speed said to have been not greater than eight miles an hour. The car was struck in the middle, carried approximately 25 feet, and pushed against an electric-light pole. None of its passengers escaped injury.



The Result of a Collision between a Locomotive and Interurban Car at Los Angeles

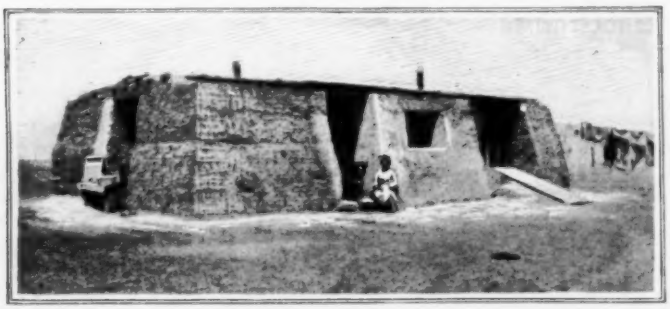
## WELL-APPOINTED PLATFORM FOR TRAFFIC OFFICER

What is undoubtedly as pretentious a platform as is provided any traffic policeman, has been placed in Washington Square, at Newport, R. I., for the use of an officer who has distinguished himself in 103 runaways. The man, who has on a number of occasions been awarded medals for his bravery, was presented with the stand by summer residents of the resort as a token of their respect and appreciation of his work. The platform is enameled in white, partly surrounded by a railing and protected from the heat and rain by a large umbrella. The trimmings are of brass, and the base of the stand is carpeted with a rubber mat.

Traffic Policeman's Platform at Busy Newport Street Intersection

## A NEW AND UP-TO-DATE SOD HOUSE

Building a sod house in this country in the year 1914 is a thing that seems rather out of keeping with the times, but there was evidently good reason for this antiquated mode of construction in the house illustrated, because of the difficulty of obtaining any other kind of building material. This sod house is located in a timberless section of Montana 40 miles from the nearest railroad.



This Sod House, Built in 1914, is Located in a Timberless Section of Montana, 40 Miles from the Nearest Railroad

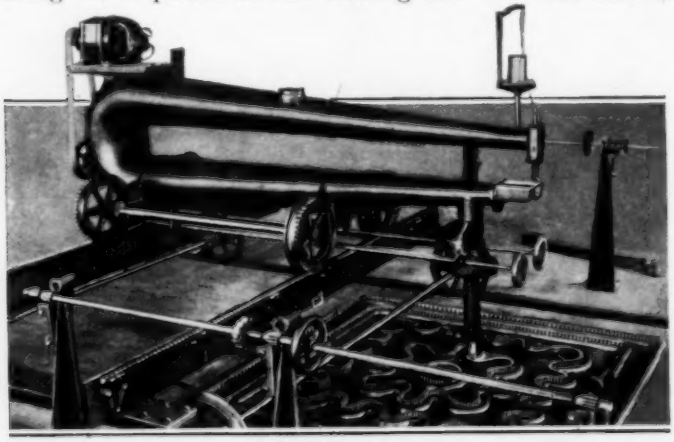
## CHEMICALLY TREATED WASTE MATTER AS FERTILIZER

Nitrogenous products such as hair, fur, garbage, and similar waste matter are being used as bases for different commercial fertilizers. When in their raw state such substances contain nitrogen in certain quantities but in a form which is not readily broken up by the soil bacteria. Because of this, sulphuric acid and strong alkalies are being employed in treating these materials to make their fertilizing content more easily attacked by the bacteria and thereby more readily available for plant absorption.

¶In Wyoming, where agriculture depends almost entirely on irrigation, careful measurements of all the water resources of the state are being made.

## MACHINE SEWS COMFORTERS AUTOMATICALLY

Guided mechanically so that unskilled labor may be employed in operating it, a power-driven sewing machine has been developed for use in the manufacture of comforters. The action of the apparatus is the inverse of that of ordinary sewing machines, for in this case the needle moves over the work, following a set pattern, instead of the latter being guided beneath it. In order to make this possible the machine is mounted on tracks which allow it to be moved in almost any direction. The work is held in a frame and passed between the parallel arms of the machine. The guiding member is extended beneath the lower arm and consists of a shaft, at the end of which is a cogwheel that travels along a cogged pattern placed on the floor.



One of the Power-Driven Machines Used in the Manufacture of Comforters

Twin-Cylinder Motorcycle Pulling an 1,188-Pound Load up a 24-Per-Cent Grade

## LOADED BUGGY IS PULLED UPHILL BY MOTORCYCLE

In order to demonstrate the hill-climbing power of a twin-cylinder, three-speed motorcycle, a novel test was recently made on a steep grade in a Pennsylvania town. A buggy with two persons seated in it, was hitched to the cycle, on which two other men were riding. The weight which the machine was expected to pull amounted to 1,188 lb., while the hill, it is claimed, has approximately a 24-per-cent grade. The machine with its added load made the climb on low speed without especial difficulty.

## PROTECTING LUMBER PILES FROM HIGH WINDS

When lumber piles are built in an open yard where they are unprotected by sheds, there is always some danger of the boards being blown about during high windstorms. To overcome this a lumber company has adopted a simple plan of utilizing the weight of the boards as a means of tying them down. In erecting a pile a spacer plank near the top is allowed to project for approximately a foot on opposite sides. Then when the pile is completed, a second plank is laid across the top of it, paralleling the one beneath. The protruding ends of these two cross strips are fastened together by means of a square frame which binds the upper part of the pile and prevents the top boards from being moved by wind.

A Lumber Yard in Which the Unprotected Piles of Boards are Held Intact by Binding Members

## ACETYLENE SIGNAL LANTERN FOR FOREST SERVICE

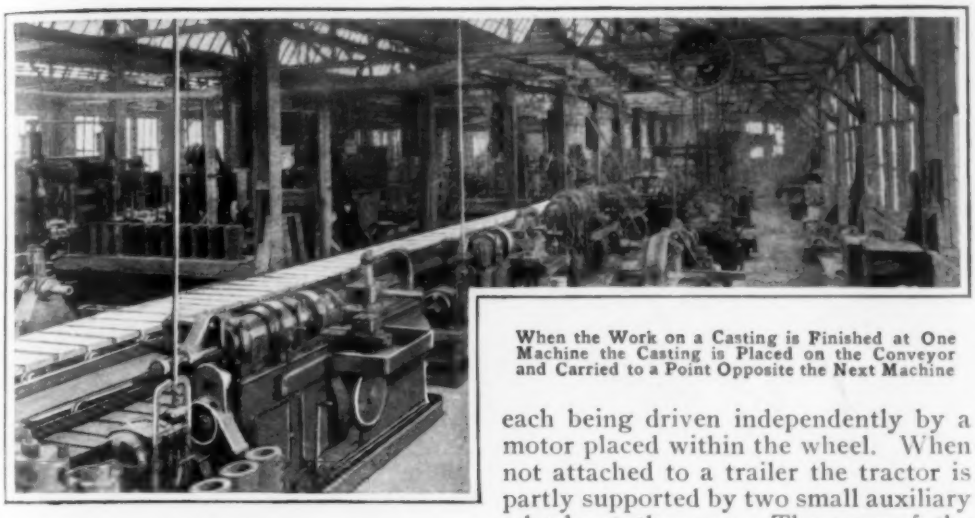
The new acetylene signal lantern used in the national forest service for signaling by the Morse telegraphic code works so successfully that messages can be read by the naked eye at a distance of 15 miles in clear weather, and the lantern has been worked to good advantage over a distance of 19 miles when good binoculars were used at the receiving station. The gas is produced by the ordinary carbide and water, and the tank, which is adjustable to the back of the lantern, is sufficiently large for about three hours of signaling. When burning normally only enough gas is admitted to the lantern to maintain a minute flame, but when the controlling key is depressed the gas aperture is enlarged and the flame flares up instantly, producing a "flash," which continues so long as the key is kept depressed. The dots and dashes of the Morse code are produced by the manipulation of the key.

## HEAVIER FIELD ARTILLERY FOR UNITED STATES

As a result of their demonstrated value in the European war it is probable that heavy field guns will soon become an important part of the fighting equipment of the United States. The 6-in. howitzer now in use throws a projectile weighing 120 lb. Experiments are now being made by the ordnance experts with a gun of 7.6-in. caliber that throws a 240-lb. projectile; with one of 9.5-in. caliber that throws a 450-lb. projectile, and with one of 11-in. caliber that throws a projectile weighing close to 750 lb. The 11-in. gun has an estimated range of from 15,000 to 16,000 yards, or about nine miles. An interesting feature in connection with the experiments is that the experts are said to have little faith in guns larger than 11-in. caliber for field operations. In addition to the contemplated use of heavy field artillery, plans are being considered for the installation of high-power coast-defense guns that can be transported on specially built railroads from established bases located inland to strategic points on the coast line. This system would permit a rapid concentration of a great number of guns about any port that might be attacked by a hostile fleet.

## NOVEL POST-CARD RECORDS FOR PHONOGRAPH

Post cards on which miniature disk-phonograph records are pasted are novelties which are becoming more or less popular in certain parts. The cards employed are of standard size, while the records, which are secured in the middle, occupy about one-half of the space on the side to which they are attached. They are not dissimilar to many of the sample records which from time to time have been used for advertising purposes, excepting that they are slightly smaller in size. While they are not of indefinite life, the records give surprising results the first time or two they are used.



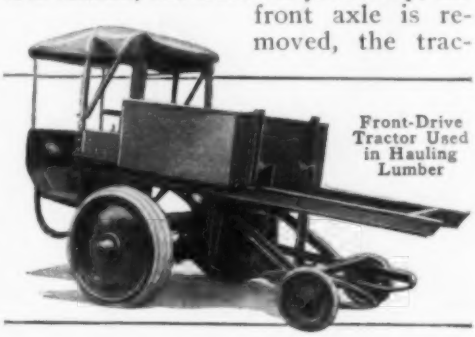
When the Work on a Casting is Finished at One Machine the Casting is Placed on the Conveyor and Carried to a Point Opposite the Next Machine

## ENDLESS-CHAIN CONVEYOR FOR MACHINE SHOP

The problem of conveying the work from one machine to the next has been solved in one large machine shop by the installation of an endless chain, or platform, running the entire length of the shop. The conveyor does not run continuously, but intermittently, being timed to move a certain distance every 20 minutes, which is the time required for the longest operation on a piece of work. When a workman finishes working on a casting he places it on the platform and at the proper time it is carried forward to a point opposite the next machine, where it is removed by the workman who does the next machining job on it. By the time the various castings have reached the end of the line, all the operations have been completed, and the parts are ready to be assembled or placed in storage.

## ELECTRIC TRACTOR OF NOVEL DESIGN

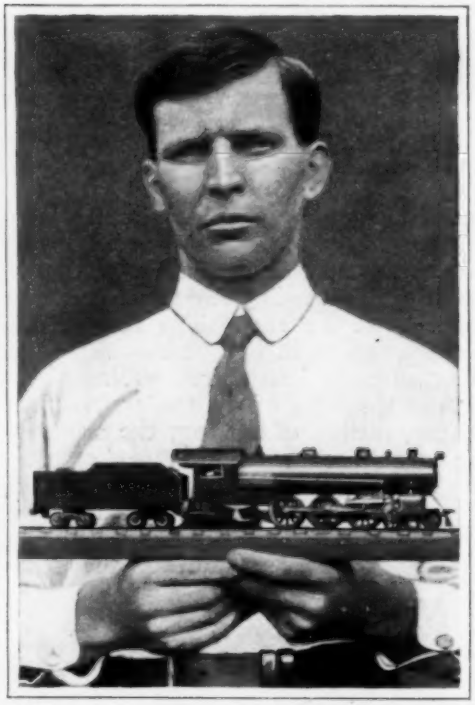
An electric front-drive tractor, now being used in hauling lumber, is so designed that when attached to a trailer it acts with the trailer as one vehicle. Power is furnished by a storage battery and is applied through the front wheels, each being driven independently by a motor placed within the wheel. When not attached to a trailer the tractor is partly supported by two small auxiliary wheels at the rear. The rear of the body consists of two beams which are shaped to fit into corresponding pockets at the sides of the trailer. During the operation of loading, the ordinary front-axle construction is used and the trailer is hauled by horses. As soon as it is loaded, the trailer is jacked up, the front axle is removed, the tractor is backed in so that the projecting rear ends of the frame slide into the metal pockets of the trailer, and the two vehicles are secured together by hooks. The small rear wheels of the tractor then clear the ground about 6 in. and the two vehicles are handled as one. The center of gravity of the tractor is well back of the front axle so that there is enough weight on the small wheels to preserve its stability when it is detached. As a further precaution against upsetting forward, rounded skids are provided that project downward from the front of the tractor.



Front-Drive Tractor Used in Hauling Lumber

## MINIATURE STEAM ENGINE BUILT BY SWITCHMAN

Without any experience as a mechanic, a railway switchman at Lorain, Ohio, has constructed a perfect-working, miniature steam locomotive of the Pacific type. The man drew his own patterns, did the molding and casting of the various parts from crude materials, executed the machine work, and assembled the engine. Combined with the tender the total length of the locomotive is only 16 in. The driving wheels are 1¼ in. in diameter, the wheel base 7⅛ in., and the cylinders $^{13}/_{32}$ in. in diameter with a ½-in. stroke. The boiler has a working pressure of 30 lb. The fire box, which is 1¾ in. long and 1⅜ in. wide, is fitted with an alcohol burner which is fed by gravity from the supply tank. Placed between the frames back of the cylinder saddle is a pump which takes the water from the tank on the tender and keeps the boiler properly supplied. The locomotive has a headlight, whistle, safety valve, and water glass, all of which are in working order.



**Miniature Steam Locomotive Built from Crude Materials by a Man without Mechanical Training**

## INDICATOR FOR DOORS IN SHIP'S HOLD

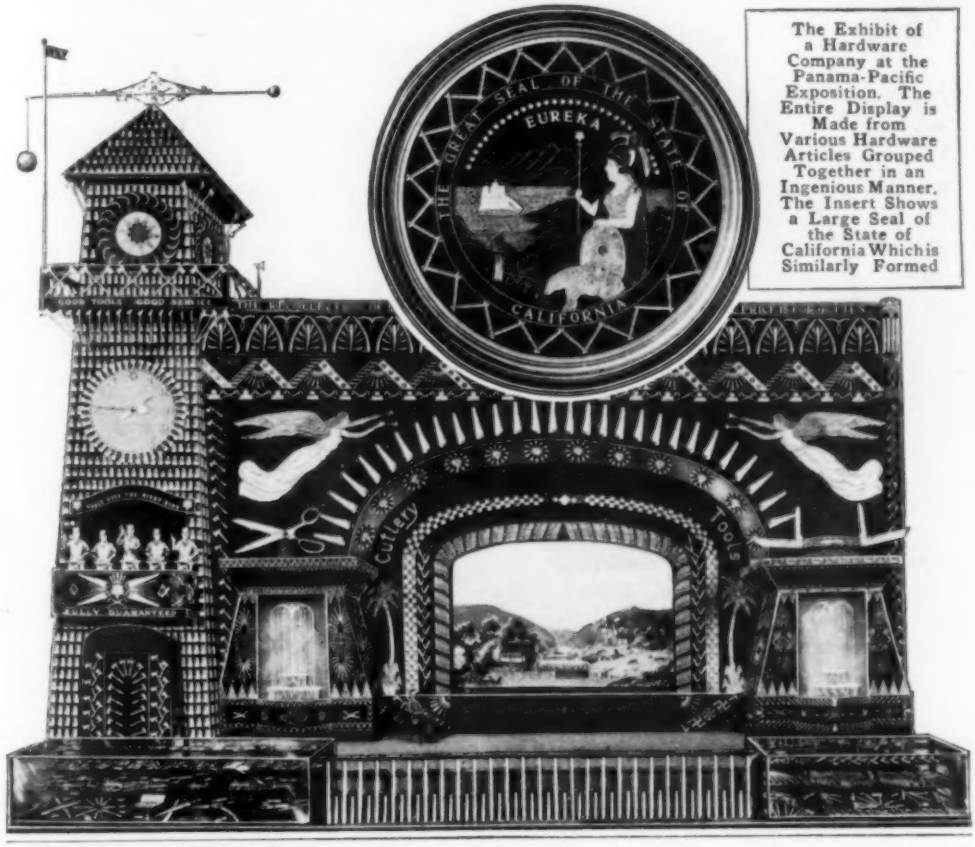
An important safety feature now being installed on seagoing vessels is an electrical apparatus for closing the water-tight doors between the bulkheads of the hold combined with an indicator that shows when each individual door is closed, both the indicator and the door-closing apparatus being located on the bridge. The indicator is housed in a teak case and consists of a plan view showing the various decks and the location of the bulkheads and doors. Each door is indicated by a small window fitted with ruby glass, and when the door is closed an electric lamp behind the window is lighted. Two lamps are provided for each of the windows as a precaution in case of the failure of one of the lamps. An additional window placed in the corner of the indicator shows whether or not the current is on.

## NOVEL HARDWARE DISPLAY AT SAN FRANCISCO

One of the large hardware-manufacturing companies has constructed an exhibit at the Panama-Pacific Exposition which has attracted considerable attention because of the ingenious way in which it has been executed. A stage on which a river and mill scene is shown has been produced by grouping thousands of different pieces of hardware, while adjacent to this is a clock tower similarly built.

The old mill, standing at one side of a river, with characteristic waterfall, spillway, and revolving wheel, is formed entirely by articles with which almost every one is familiar. Moving nickeled chains and revolving auger bits are used to produce the effect of running water, which, when viewed from a short distance, looks very real-

istic. A steamboat crossing the stream in the background is composed of a saw, carpenter's level, hose nozzle, and a mallet, while a windmill on one of clock tower is an anvil chorus which is manipulated mechanically so that each 15 minutes two smiths at each end of the row of manikins raise their




The Exhibit of a Hardware Company at the Panama-Pacific Exposition. The Entire Display is Made from Various Hardware Articles Grouped Together in an Ingenious Manner. The Insert Shows a Large Seal of the State of California Which is Similarly Formed

PHOTOS BY ROCKWELL FEATURE SERVICE

the river banks consists of cleavers, penholders, and lead pencils. The water wheel is made of files, saws, drill bits, and hammer handles.

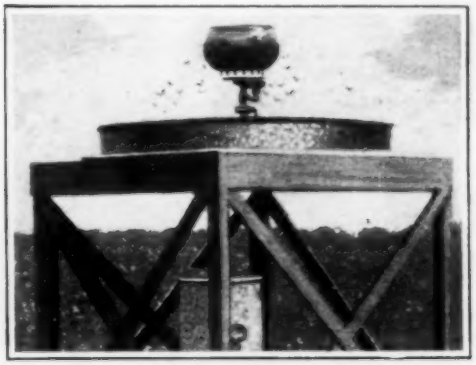
On each side of the stage are artificial fountains which are so well worked out that the illusion is nearly perfect. Fine chains, which at first sight appear as a spray, rise and fall as if impelled by varying water pressure, while spinning auger bits are again used to produce the whirling effect of water falling from the upper to the lower basins. Door hinges, compasses, and chains are used in forming the palm trees set at the sides of the fountains.

In a balcony on the front side of the hammers and apparently play the chimes on their anvils. The figure in the center strikes the hours with a heavy sledge.

A seal of the state of California, formed from approximately 900 different pieces of hardware, is placed on another side of the tower. This is about six feet in diameter and is built against a background of black velvet. The helmet and crest, worn by the goddess, are made of a hatchet and sickle fitted together, while both the hair and cloak are formed of brass chains; the armor, of nickeled chains; the shield, of the copper bottom of a boiler; the bear, of steel wool, and other objects of similar materials.

## PROTECTING SUGAR BEETS FROM MOTHS

The principle contained in the old story of the moth and the candle is applied in an effective way in California

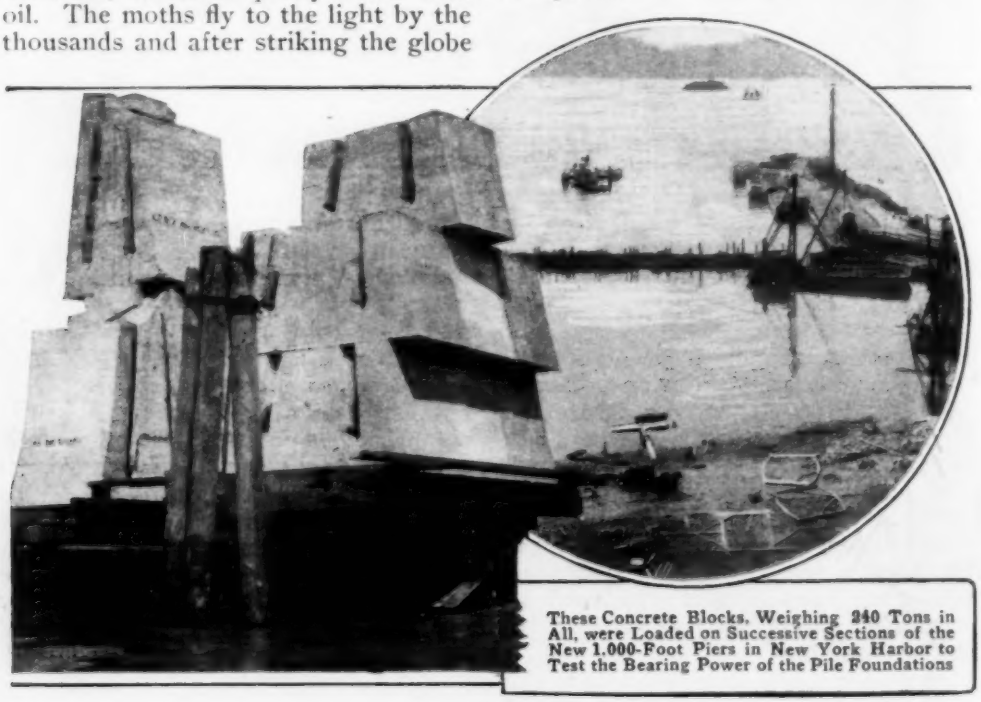


Thousands of Moths are Destroyed Every Night through the Fascination of This Acetylene Lamp Set in the Middle of a Sugar-Beet Field

for protecting sugar beets from the moth of the cutworm. For this purpose an acetylene-gas light is used, the lamp being set upon a platform in the field. Below the lamp is a pan, 4 ft. in diameter, which is partly filled with oil. The moths fly to the light by the thousands and after striking the globe fall into the oil where the moths, with the eggs they carry, are destroyed. As many as 7,000 moths have been found in one pan after a night's exposure.

## BEARING POWER OF PILING TESTED BY CONCRETE LOAD

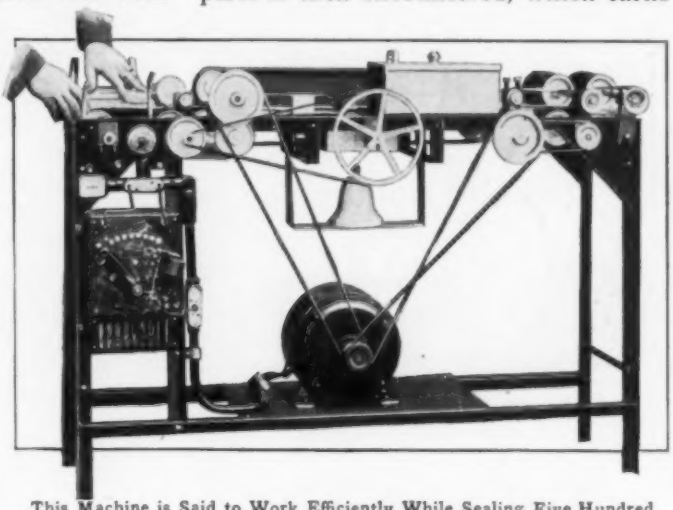
In the construction of 1,000-ft. piers in New York Harbor for the accommodation of the large modern ocean liners, it was necessary to use piles 90 ft. in length driven to a footing in soft mud. To determine the bearing power of the piles, a novel method of testing was adopted. The tops of the piles were covered with a platform, and on this platform 240 tons of concrete blocks were loaded. The first two tests resulted in a failure in the piling, which necessitated changes in construction, but the last test, in which the concrete blocks were left in place for six months, proved that the bearing power of the piling was sufficient. The concrete blocks had been made for a river wall around Manhattan Island and will be used for that purpose after all tests are completed.



These Concrete Blocks, Weighing 240 Tons in All, were Loaded on Successive Sections of the New 1,000-Foot Piers in New York Harbor to Test the Bearing Power of the Pile Foundations

## HIGH-SPEED MACHINE BUILT FOR SEALING ENVELOPES

Capable of handling approximately 30,000 separate pieces of mail an hour, an envelope-sealing machine has been developed by a government employe and patented with the provision that the invention may be used by either the government or individuals without the payment of royalty. It is driven by electricity and works on the endless-belt principle. The letters are fed flat, with their flaps pendent, into the machine from a hopper at the right end, passed between the surfaces of two narrow, rapidly moving belts; the flaps moistened, folded back and sealed by rollers, and the envelopes deposited in a stacker at the left end. In front of the hopper is a separating roll which allows only one envelope to be fed at a time, this from the bottom of the stack. As an envelope is carried along, the flap is raised by a lifting plate so that it passes over a moistening roller which revolves in heated water. A curved plate is then encountered, which turns the flap down and brings it in contact with the back of the envelope, which is then shot between two sets of rollers, sealed and placed in the stacker.



This Machine is Said to Work Efficiently While Sealing Five Hundred Envelopes a Minute

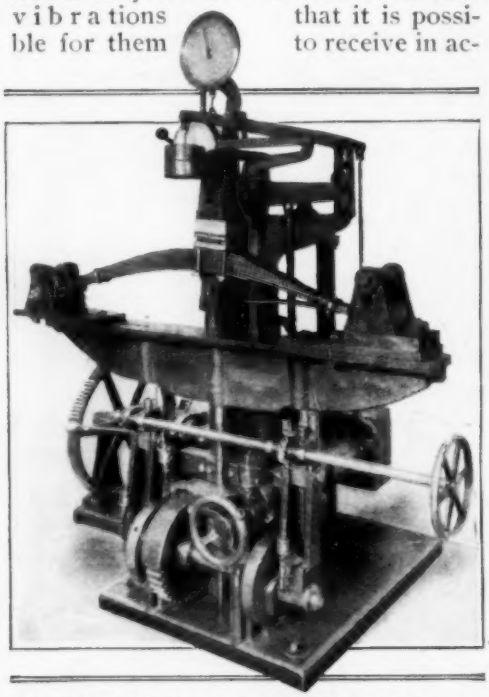
## MOTOR-CAR PORTABLE HOUSE FOR TOURIST FAMILY

In preparing for a transcontinental motor trip, a New Jersey man has constructed a touring body for his car which is essentially a portable, light-housekeeping apartment. It answers this description, for it is intended not merely as a sleeping compartment, but also as a dining room and kitchen during unpleasant weather, as well as a living room and storage place for much of the equipment which is being carried. It is covered with a heavy-canvas top which is adequate to keep out water and cold. The cross-country trip is being made by a man and his wife who expect to make their car their home throughout the journey, cooking all of their own meals and escaping hotels entirely.

The House on Wheels Which a New Jersey Family is Using on a Transcontinental Trip

## HOW AUTOMOBILE SPRINGS ARE TESTED

When automobile springs are tested they are placed in a testing machine which subjects them to the most severe vibrations that it is possible for them to receive in actual service. The spring illustrated stood up under more than 1,000,000 vibrations of 4 in. each, under a load corresponding to the weight of car and passengers that it would have borne if it had been in actual service. None of the leaves except those that broke showed any effect of the test. The operating speed of the testing machine was 24 vibrations a minute, and more than 28 days of continuous running was required to break the springs as shown.



This Machine for Testing Automobile Springs Subjects Them to the Most Severe Usage That It Is Possible for Them to Receive in Actual Service

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¶Frame buildings on the Canal Zone are made ant-proof by resting the posts on concrete footings having shallow gutters. The gutters are kept filled with the standard larvacide used by the sanitary department.

## LINCOLN HIGHWAY PICTURED BY MOVIE CAMERA

Motion pictures are now being made of the Lincoln Highway, dealing with the road conditions along the entire route between New York and San Francisco, as well as the scenery and points of historical and industrial interest. Between 7,000 and 10,000 feet of film will be exposed and subsequently shown in various cities in different parts of the country, including all points touched by the transcontinental road. The tour is being made by official cars of the highway commission and will be completed some time in September. The purpose of the undertaking is to give publicity to the highway and stimulate an added interest in its upbuilding and use.

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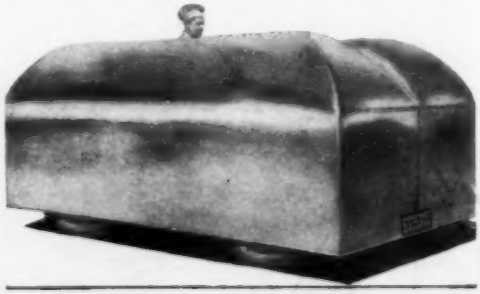
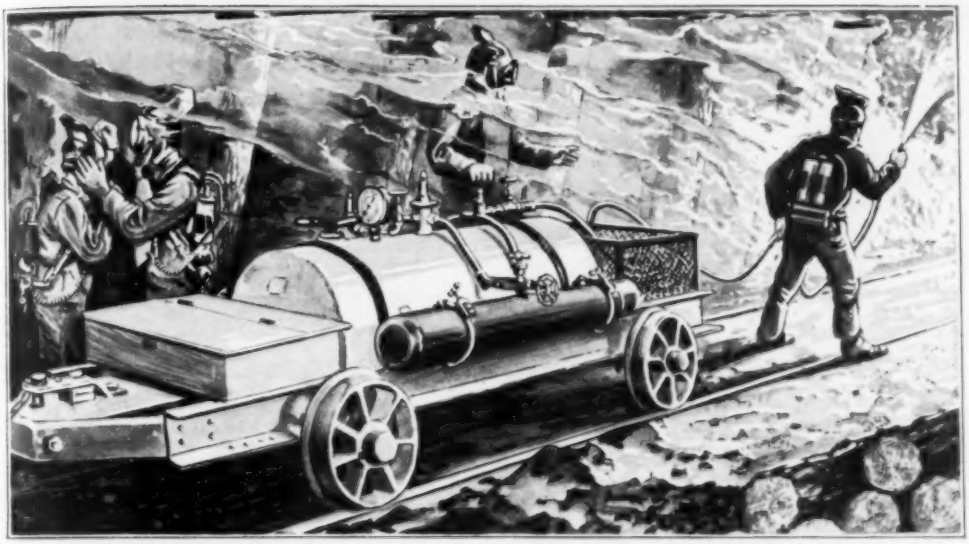
## AUTOMOBILE BODY SHAPED LIKE LOAF OF BREAD

When a garage in Indianapolis burned recently all the cars were destroyed except one, an electric brougham. The coach body of this car was burned off and the aluminum battery-box covers were melted, but the battery, frame, and chassis were uninjured. What was left of the car was acquired by an enterprising baker, who fitted it with a new body consisting of an enormous model of a loaf of bread in which seats were arranged for four or five persons. The car is now driven about the streets regularly as an advertisement of the baker's product.



Electric Car Used by an Indianapolis Baker for Advertising His Bread



Chemical Car Used in a Pennsylvania Coal Mine for Laying the Dust and Fighting Mine Fires

## FIRE-FIGHTING CAR FOR COAL MINE

An apparatus that works on much the same principle as the chemical engines used by fire departments has been placed in service in a coal mine in Pennsylvania for sprinkling the dust and extinguishing mine fires. It consists of a tank car mounted on track wheels so that it can be quickly hauled by a motor to any part of the workings. The tanks are of such capacity that an ample supply of chemicals can be carried.

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## PISTOL USED FOR PLATING METALLIC SURFACES

Bearing much the appearance of an automatic pistol, an ingenious electric instrument has been invented for plating metal surfaces. The barrel of the device, which is approximately six inches long and an inch square, is lined with sheets of mica. A flexible shaft on one side of the apparatus actuates a pair of small rollers through which a thin ribbon of the plating agent is fed into contact with a carbon plate fitted in the breech. When the ribbon touches the carbon an electric current is short-circuited, resulting in a flash which melts the agent and simultaneously ignites an oxyhydrogen gas that is carried into the "pistol" through a tubing extending into the stock. The

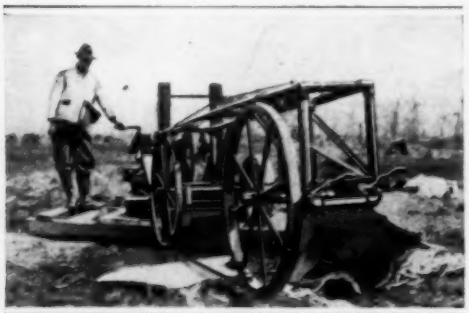
Silverplating a Spoon with the Electric-Gas Pistol: In Most Instances the Instrument is Held so That the Muzzle Is Approximately Six Inches from the Article to be Plated

explosion blows the molten metal out of the barrel with sufficient force to make it adhere to the metallic surface against which it is directed. While the device is in operation, the explosions

follow in rapid succession, sending out a stream of silver, gold, copper, nickel, or other metal or alloy of which the ribbon may be composed.

## MACHINE FOR SAWING STUMPS LEVEL WITH GROUND

An ingenious but simple machine for sawing stumps off level with the ground has been invented by a farmer



This Stump-Sawing Machine Consists of a Band Saw Driven by a Gasoline Engine

in eastern Arkansas, where there are thousands of acres of newly cleared land containing from 10 to 50 stumps to the acre. The machine is mounted on a sort of sled that is dragged over the ground by a team and consists of a band saw run by a gasoline engine. The band saw runs on two wheels which are carried on a counterweighted frame, one end of which is pivoted to the sled. The machine is dragged up to the side of a stump, the engine is started, and the frame is swung so that the saw exerts the right pressure against the wood. The wheels are of such size that the top of the saw clears the highest stump.

## HORSE-DRIVEN ROTARY HOE NEW FARM IMPLEMENT

A rotary hoeing machine has recently been invented which is intended for different kinds of cultivating work on a farm. It is made with a series of revolving prongs fixed in separate sets on parallel axles which operate and are regulated independently of one another. The machine may be used for cultivating the soil between rows of young plants, or for breaking up heavy clods and putting a field in shape after plowing. The radiating fingers are long and, when set to do so, dig deeply into the ground, breaking through the crust and loosening the soil to a depth of several inches.

This Shows the Implement in Use on Plowed Ground, Breaking Clods and Loosening the Soil

## UNUSUAL FLOATS USED AT A CALIFORNIA FETE

"The Bungalow," a New Idea in Floats, Particularly Appropriate for a California Parade

A Graceful Chariot Float Which was Exquisitely Developed in Flowers

A Marine Float, Beautifully Executed in Flowers and Gauze, Attracted Much Attention

This Locomotive, Like the Other Floats Shown Here, was Mounted on a Motor Truck

## TON OF MOVIE FILM BURNED IN MAKING EXPERIMENT

Approximately 2,000 lb. of nitrocellulose film was burned during a test conducted before underwriters, fire experts, and motion-picture men at Leonia, N. J., recently, in an attempt to determine the proper size for gas vents in film-storage vaults. The experiment was carried out in a vault built particularly for the purpose. It had a capacity of 133 cu. ft., was constructed of 12-in. terra-cotta tile, and provided with a glass-covered vent 285 sq. in. in area. The interior was fitted with racks on which the incased reels were placed, the spaces between each being packed with unprotected film. The ignition of the inflammable material was effected by means of a spark plug. The flash shattered the glass covering of the vent and caused a jet of flame to shoot more than 70 ft. from the aperture in the wall. The heat of the fire, which burned for three minutes, was so intense that rocks 50 ft. away were crumbled by it. The experiment merely served to show that the size of the gas vent had been rightly figured, for had it been too small, an explosion would have occurred which would have instantly wrecked the vault.

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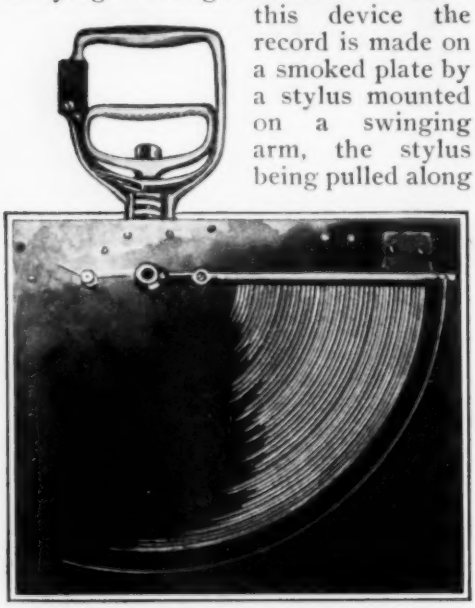
¶The Navy Department has recently issued and placed on sale a book containing engraved reproductions in colors of the flags of all maritime nations.

## DEVICE RECORDS FATIGUE OF MUSCLES

A simple but effective device is now being used at a western university for studying the fatigue of muscles. With this device the record is made on a smoked plate by a stylus mounted on a swinging arm, the stylus being pulled along



Device for Studying the Fatigue of Muscles, with a Typical Record

the arm at a regular rate by clockwork. At each tick of the metronome the person being experimented on grips the handle with all his strength. This swings the arm downward and the stylus traces an arc on the smoked plate, the angle covered by the arc showing the amount of force exerted. As the stylus is drawn inward by the clockwork each arc is spaced inside the one preceding it, and the record made in this way shows just how fast the muscles tire and how long it takes for them to become too fatigued to continue the process.

## FIRST DIRIGIBLE ORDERED FOR AMERICAN NAVY

Definite steps have been taken by the navy in carrying out its aviation program, which was outlined with the army's plans in the February issue of this magazine. Secretary Daniels recently approved a contract for the construction of the first dirigible to be built for the navy. This, it is expected, will be delivered in September at the Pensacola, Fla., aeronautic station, where it will be used particularly for experimental and training purposes.

The craft will be 175 ft. in length, 55 ft. in height, and of 110,000 cu. ft. gas capacity. It will be capable of carrying eight men, will have a speed of approximately 25 miles an hour, and, when loaded to its capacity, a radius of action of about two hours. This, however, can be increased by lessening the number of occupants and replacing their weight with gasoline. The contract price of the craft is $45,636.

Two new flying boats of the Curtiss type have been delivered to the navy of late, while three Burgess machines are to be ready this summer. Bids for three additional craft are to be asked immediately. The armored cruiser "North Carolina," which spent the winter in the Mediterranean, is to become the new aviation ship, after it has been thoroughly overhauled, and will be stationed at Pensacola.

## BOATS USED ON INTERIOR RIVERS OF CANADA

In the interior of some of the northern provinces of Canada transportation facilities are nearly as primitive today as they were a hundred years ago. It is in these wild districts, where many of the forests are still undisturbed, that the native hunter and trapper are as much in evidence as ever, and the trading post also. The rivers for this reason are used for transporting food stores and supplies to the fur posts.

North of the fifty-third parallel birch-bark canoes are rarely if ever seen, even with the Indian tribes, for what little birch there is in those parts is too small for canoe purposes. For this reason the Indians build their canoes, much the same as many of the South American and other tribes of Indians, by hollowing out the trunk of a large tree. This is done by chopping and burning, and generally the re-

One of the Big Freight Scows Shooting a Fall on Its Way Downstream. These Craft are Employed in Carrying Supplies into Canadian Wildernesses

Above Is One of the Hollowed Canoes Used by Certain Tribes of Indians in the North, While at the Side is Shown a Freight Scow on Its Return Trip, being Drawn by Its Crew

Row of Newly Built Scows Lined on a Bank Prior to being Placed in Service as Freight Carriers between River Trading Points in the Interior of Canada

sult is an ill-balanced and heavy craft. With the coming of the white men into the North, however, a new boat was introduced. It is a large scow built of heavy timbers; a craft which long ago was used on many of the rivers of this country. It is of light draft and so heavily constructed that it easily withstands the rough waters of the northern rivers, readily carrying a number of men and several tons of freight.

The streams flow into the wilderness, and down them, over falls and through tossing rapids, the raftlike scows plunge with their loads, continuing often for hundreds of miles into the interior. When their destination is reached they are reloaded, this time with furs, and ropes tied to their bows by which the half-breed crews pull them back whence they came. Often the shore line is too steep to be followed, which means that the men must take to the water. In the spring this is ice-cold and they wade ahead through it, often wet up to their waists, for hours at a time. Many of these return trips take from six to eight months to complete, although possibly not more than a month was consumed on the downstream journey.

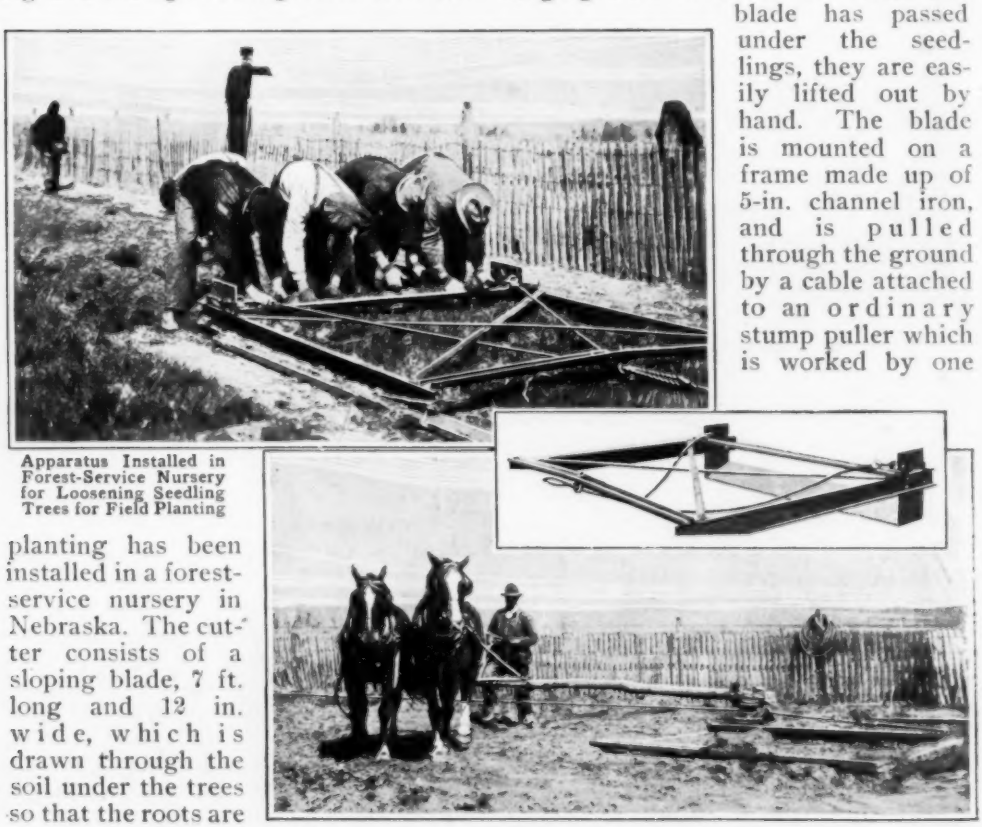
## ODD SUCCESSION OF DEATHS CAUSED BY ELECTRICITY

Three persons, each ignorant of the real source of danger, were killed one after the other in a peculiar manner when a 2,200-volt electric wire fell into the back yard of a Los Angeles residence some time ago, and caught on a wire fence. The first victim, a man, went through the rain to a rabbit hutch at the rear of the property. As he placed one of his hands on the latch of the hutch gate he was thrown to the earth and killed by the electricity which passed through his body. His wife, seeing him fall, rushed to his assistance and, being unaware of what had caused his death, bent over him. The heavy current shot through her, ending her life.

A neighbor seeing short, blue flames leaping from the ground about the bodies of the man and woman, and also ignorant of their nature, rushed forward with a bucket of water, intending to extinguish the mysterious fire. As he dashed the water to the ground the current followed the stream and killed him. The wife of this man and a policeman then started into the death trap, but were hurled to the earth and merely stunned before reaching the spot of greatest danger. Subsequently the cause of the trouble was ascertained.

## NEW TREE DIGGER FOR FORESTRY SERVICE

An interesting apparatus for loosening and lifting seedling trees for field planting has been installed in a forest-service nursery in Nebraska. The cutter consists of a sloping blade, 7 ft. long and 12 in. wide, which is drawn through the soil under the trees so that the roots are not injured, the depths usually required ranging from 10 to 16 in. After this blade has passed under the seedlings, they are easily lifted out by hand. The blade is mounted on a frame made up of 5-in. channel iron, and is pulled through the ground by a cable attached to an ordinary stump puller which is worked by one



Apparatus Installed in Forest-Service Nursery for Loosening Seedling Trees for Field Planting

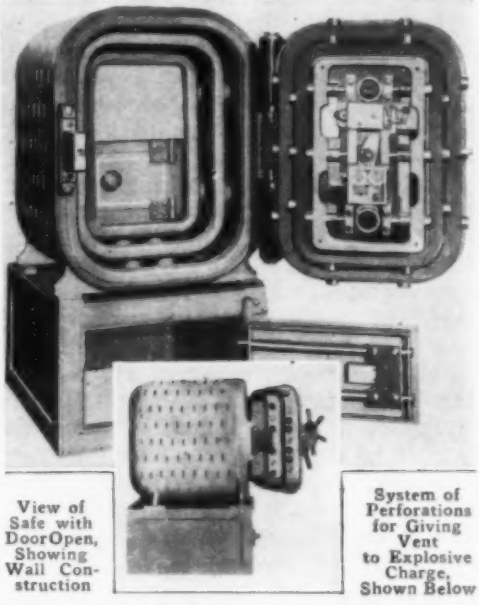
or two horses. With this apparatus the trees can be taken out at a trifle less than half the cost of digging them out with a spade.

## HEAT USED INSTEAD OF INK IN GRAVURE PROCESS

An American artist has originated a new process for printing pictures which, aside from producing unusual effects, is in its technique a complete departure from established methods, most of which are of European origin. The originality of the process lies in the fact that heat is employed instead of ink in making imprints. The system is a very difficult and delicate one and is not intended for ordinary commercial purposes. Also, practice has narrowed the choice of paper that may be used in the work to Japanese vellum and Manila stock. A series of plane surfaces, from high to low, the former for producing the dark values, the latter for high lights, and the intermediate ones for the half-tones, are etched on a brass plate. This is then heated to a temperature that scorches the paper when in contact. The result is claimed to be a remarkable softness and transparency. Responsibility for this is due to the color being in the paper itself, rather than on its surface as when ink is employed. It is necessary, however, that extreme care be exercised throughout to properly control the heat so that excessive carbonization of the paper does not occur.

## BURGLAR-PROOF SAFE MADE OF MANGANESE STEEL

Unless professional cracksmen are able to devise some mode of attack more effective than any now known, they are likely to find themselves completely and permanently baffled by a new type of burglar-proof safe that has just appeared on the market. This safe is made of manganese steel, a metal so hard that it is practically impossible to drill it, and has three walls with intervening air spaces of about an inch, the outer walls serving to protect the inner wall from direct attack. The inner wall is solid, while the middle and outer walls are perforated with small vertical slots. Corresponding slots in the two walls are offset with reference to each other so that it is impossible to pass a drill or torch through them to attack the inner wall. There are three doors which work on a single hinge and act as one. These are arranged like the walls and are perforated, each door locking with the corresponding wall. In tests made with powerful charges of dynamite and nitroglycerin placed between the inner and middle walls it was found that the perforations furnished sufficient relief for the gases, and that this, combined with the great strength of the walls, prevented the safe from being damaged in any way. In these tests the flames produced by the explosion shot out through the perforations for a distance of 10 feet or more. Attempts to blow open the doors resulted in the same way. The base chest on which the safe rests is made of ordinary steel and is not burglar-proof, being designed to utilize space that would otherwise be wasted.



View of Safe with Door Open, Showing Wall Construction

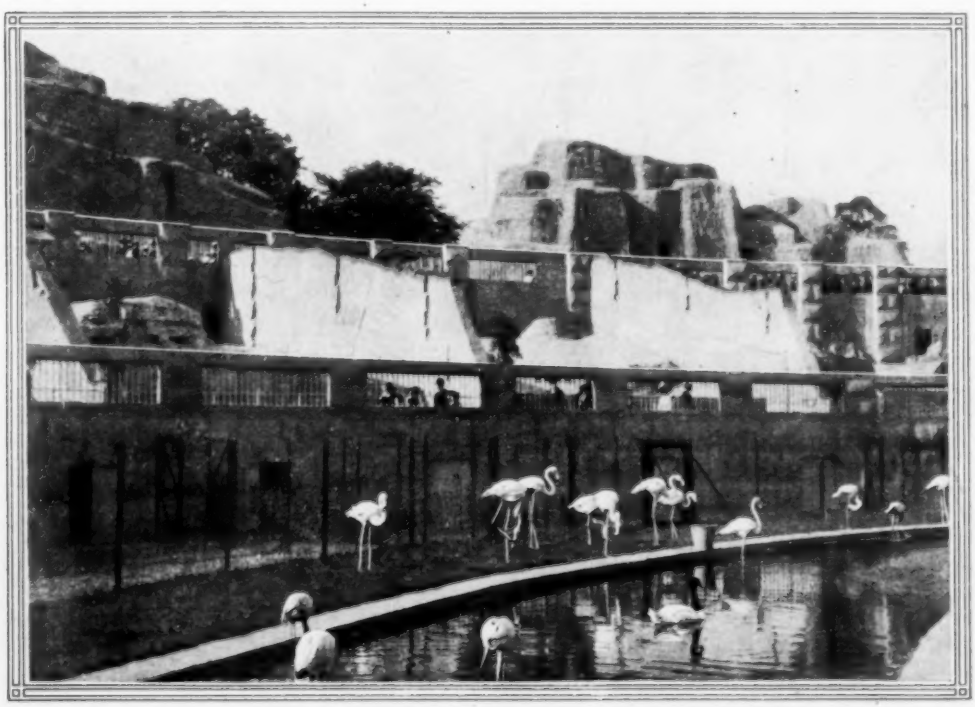
System of Perforations for Giving Vent to Explosive Charge, Shown Below

## MAKING USE OF PAMPHLETS IN PUBLIC LIBRARY

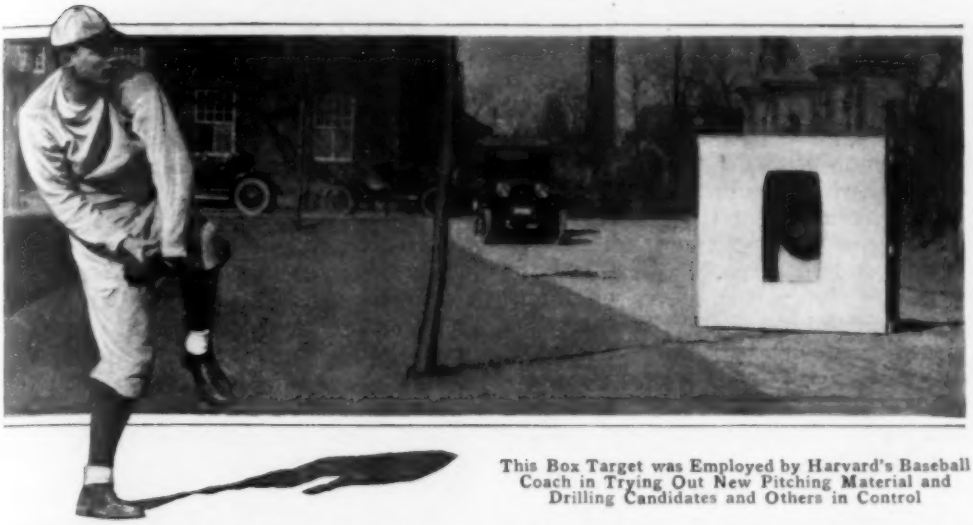
To enable a more practical use to be made of the thousands of pamphlets and bulletins dealing with current topics, received at the Chicago Public Library, this material is being classified according to subjects and placed in heavy paper holders which may be taken from the building upon application. While in the past it has only been possible for a person seeking the latest available information on subjects covered in documents of this kind to enjoy the privileges of the reading room, compilations of these pamphlets are now being sent into the grammar and high schools when they are wanted. Each box collection carries a typewritten list of its contents. A quite broad range of subjects is included in this packet library, and by making use of this opportunity it is frequently possible to obtain later information than can be found in reference books of even comparatively recent publication.

## ZOOLOGICAL GARDENS WITH IMITATION CLIFFS

Cliffs built of concrete, with dens and caves for wild animals, form a striking feature of the zoölogical gardens at Regents Park, London, which were completed in 1914. These cliffs are popularly known as the "Rocky Mountains," and were built particularly for animals of the temperate zone. The cavities in the lower part of the structure are for such animals as bears, wolves, and lynxes, while those at the top are for chamois and other mountain-climbing animals. A concrete pool at the foot of the slope serves as a home for wild fowl of various kinds. The whole structure is of poured concrete, the surface of which is finished to look like natural stone. To enable visitors to see the animals in what seem to be their natural haunts, passageways, protected by iron railings, are provided along two levels. The cliff masses give an illusion of height and distance in excess of the reality.



Concrete Cliffs in the New Zoölogical Gardens at Regents Park, London



This Box Target was Employed by Harvard's Baseball Coach in Trying Out New Pitching Material and Drilling Candidates and Others in Control

## TRAIN BASEBALL PITCHERS WITH BULL'S-EYE BOX

For drilling pitchers and teaching them control, as well as for trying out new material, the coach of Harvard's baseball team developed a pitching box which proved useful during the spring training season. The device consists of a large canvas and board box approximately six feet in height and two feet in depth. In the middle of the front side is a rectangular hole, 3 ft. by 2 ft., while within the box, against the back wall, is a red-flannel bull's-eye, 1 ft. in diameter. When in use, the box is placed at a distance from the pitcher's mound which corresponds to the home plate. To hit the bull's-eye is in this instance the thing to be avoided. The pitcher must throw a curve which breaks quickly, so that the ball after entering the aperture does not strike the red flannel. This readily shows the pitcher, and his coach as well, what he can do. It also does away with all arguments on the part of young pitchers who are often prone to accuse a catcher of reaching forward and pulling a ball away from the plate.

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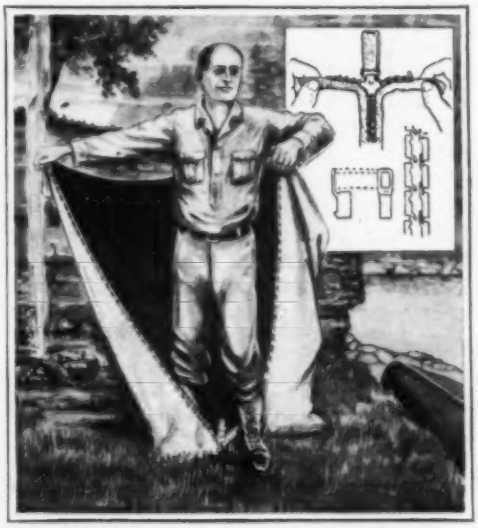
¶It is proposed to station a squadron of eight aeroplanes at Governor's Island as one element in the defense of New York City.

## SIMPLE WAY OF FASTENING SLEEPING-BAG FLAPS

Intended especially for fastening together the two flaps of a sleeping bag or tent, an ingenious device has been introduced abroad which is apparently very satisfactory and easily employed. It consists of a series of small metal locking members which are attached



Sleeping Bag Fitted with New Fastening Device, the Detail Construction of Which is Illustrated in the Insert

firmly to the two edges, or seams, of the opening. These individual pieces are tubelike and, in the case of those

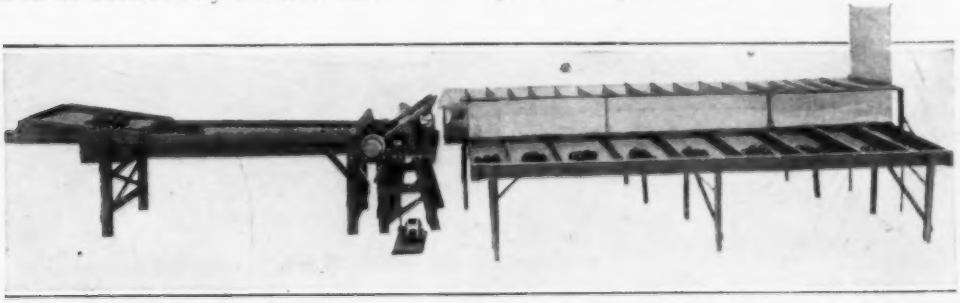
fastened to one seam, are each provided at the bottom with a small hook which projects downward. The members on the opposite seam are each fitted with a slotted projection at the top and a small knob at the bottom. A locking device, which, when the flaps are opened, remains at the bottom of the sleeping bag, brings these fasteners together, so that the hook of one engages with the slot of the other, when it is drawn to the top. To open the bag it is only necessary to pull the flaps in opposite directions as if ripping the seam apart. This disengages the hooks and pushes the locking member back to the bottom.

## ALL-STEEL CAR FOR BUREAU OF FISHERIES

An all-steel railway car to be used in distributing fish has been ordered by the government and is to be placed in service by the Bureau of Fisheries as soon as completed. The car is 65 ft. long over all and is fully equipped for movement in fast passenger trains. Some of the special features of the equipment are refrigerator tanks for carrying live fish, tanks for the storage of water, and a steam boiler for heating the car and for operating the pumps in the renewal and aeration of the water supply. Living, dining and sleeping accommodations are provided for a crew of five men, who will make the car their home. In 1914 the five fish cars now operated by the bureau traveled an aggregate distance of 131,156 miles and covered practically every state in the union. This record is to be bettered by the new car.

## FRUIT-SORTING MACHINE WORKS IN NOVEL WAY

For sorting various kinds of fruit according to size and weight preparatory to packing, an automatic machine has been invented which is said to operate accurately and without injury to the fruit. At one end of the device is a long table, the bottom of which is formed by a moving belt that carries apples, for instance, to the opposite end, where they are deposited one at a time into conical cups attached to the ends of arms mounted on springs. These cups are drawn back, by cam action, into the proper positions to receive the fruit as it is carried forward. The springs act in the same capacity as scales, the amount of their deflection being in accord with the weight of the fruit. As an apple is deposited in one of these pockets the spring is released and the fruit thrown forward into the air for a distance which is determined by its weight. Before this table is a series of bins above which are canvas hoppers into which the apples fall as they are pitched from the conical cups. Since the weight of each apple determines the force with which it is thrown, the same property also determines into what bin it will fall. The machine is driven electrically and requires only that the fruit be deposited on a feed incline at one end and removed from the respective bins as they are filled. It is asserted that ripe fruit is not bruised by the sorting and that even eggs have been handled by the machine without breakage. The machine is especially useful when competent help is scarce.



**The Weight of the Fruit Determines the Distance It is Thrown and into Which of the Pockets It will Fall**

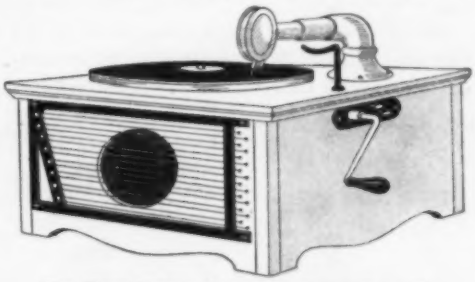
## GOLF-PLAYING DEVICE MADE FOR HOME AMUSEMENT

Designed for use on the lawn, in the home gymnasium, or on the decks of a steamer, a small golf machine has been constructed which registers the length of a drive and indicates how the ball would have flown; whether it would have gone high, clearing a bunker, or low, had it been free. It is made to be attached to some solid base and has a captive ball held at one end of an arm, the other end of which is fitted with a ring that slips over a spindle. This latter member is also at the end of a pivoted arm, attached beneath which is an indicator that moves over the face of a dial when the ball is struck. The force of the stroke revolves the ball about the spindle and moves the latter member and its arm forward. This registers the force of the drive in terms of yards. By the position assumed on the spindle by the metal ring the distance the ball would have risen from the ground is also shown approximately.

Golf Machine Made for Home Use Which Shows on a Dial the Distance a Ball would be Carried by the Force of the Stroke Made against the Captive Ball

## TALKING MACHINE AND HARP ARE COMBINED

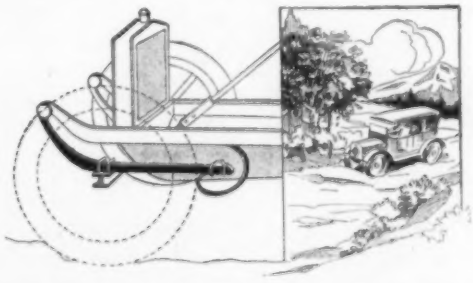
In an attempt to improve the tone quality and volume of the phonograph, a machine has been constructed that has a series of harp strings stretched across the front of its cabinet over the sound hole, which is the end of the horn. Except in this particular, the design of the instrument is quite similar to that of others. The side of the cabinet serves as a sounding board for the harp, broadening and mellowing the tones produced by the strings vibrating in sympathy with the notes sounded by the phonograph.



The Harp Strings Vibrate in Sympathy with the Tones Sounded by the Phonograph

## NEW PRINCIPLE USED IN MOTOR-CAR SPRING

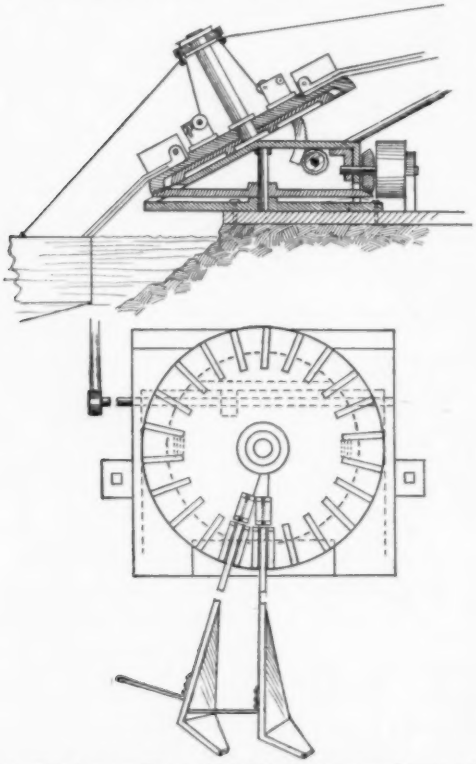
An entirely new principle in automobile construction is involved in the design of a motor-car spring recently brought out. In the usual spring arrangement the shock that occurs when the wheel strikes an obstruction acts in a vertical direction. The new spring is designed to cause the shock to act in an upward and rearward direction, and it is claimed that this feature eliminates the necessity for a shock absorber. The forward end of the frame is curved upward instead of downward, as is the common practice, while the usual semielliptic spring is replaced by a rigid steel bar pivoted to the forward end of the frame and clamped to the axle in the usual way. A C-shaped spring connects the rear end of the bar with the frame.



With This Form of Spring, Road Shocks Act in an Upward and Rearward Direction

## WATER WHEEL ERECTED ON BANK OF STREAM

A curious water wheel that has just been patented is designed to be erected on the bank of a stream. The feature



**In This Curious Water Wheel the Buckets are Immersed in the Water as They Pass Downstream, but Swing Out over the Bank and Clear of the Ground on the Upstream Movement**

about this apparatus is that the buckets and the circular plate on which they are mounted rotate in an inclined plane, so that the buckets are immersed in the water as they pass downstream, but swing out over the bank and clear of the ground on the upstream movement. The buckets are carried on arms that are pivoted to the revolving plate, and are easily adjusted to varying stages of the water by means of lines and windlasses, as shown. Placed on the lower side of the rim of the revolving plate is a series of gear teeth which mesh with a beveled gear at the low side, when the plate is in the inclined position. At the opposite end of the shaft, on which the beveled gear is carried, is a pair of beveled gears through which the power is transmitted to a belt pulley. The rotating plate is mounted on a pivoted base plate, and by means of a rack and pinion it may be swung to a horizontal position, and the buckets lifted clear of the water.

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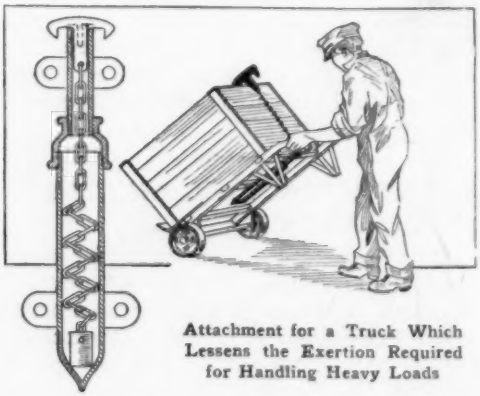
## HEAVILY LOADED TRUCKS HANDLED WITH EASE

In order to make it possible for a workman to manage a heavily loaded two-wheeled hand truck with less physical exertion than is ordinarily required, an attachment has been devised which holds the cargo in place, allowing the mass to be tilted forward until its center of gravity is over the wheel axle. When wheeling on level flooring, a man is thus relieved of the weight of the article he is moving, his concern being merely to maintain its balance while propelling the truck. This enables him to handle a much greater load than could be negotiated otherwise. The device consists of an anchor-and-chain attachment housed in a tube which is attached beneath a truck. By tipping the latter forward against the object it is to carry, the chain is drawn out to the required length, locked by dropping one of the links into a narrow

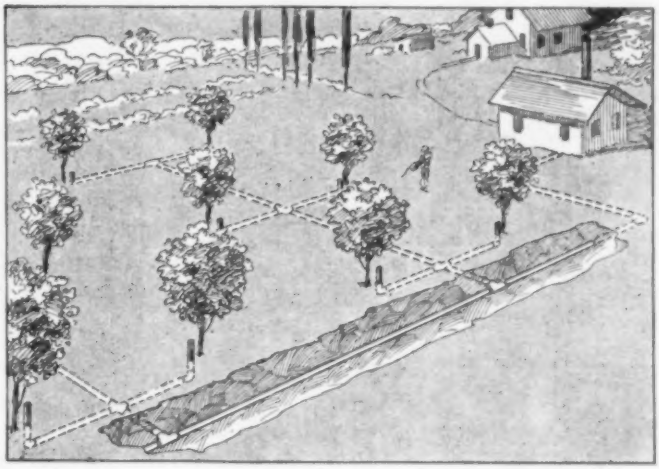


**Attachment for a Truck Which Lessens the Exertion Required for Handling Heavy Loads**

slot in the neck of the tube, and the hook engaged at any convenient point. The device may be attached to any two-wheeled truck.

## HOT-AIR HEATING PLANT FOR ORANGE GROVE

One of the greatest handicaps in raising oranges, and other fruits that are easily killed, is the danger from frost, and to overcome this a number of ingenious methods have been invented. The latest of these is a patented system with which heated air under pressure, supplied from a central heating and compressing plant, is discharged among the branches of each tree, the heated air being conveyed to the trees by underground pipes. Mains are laid in alternate lanes between the rows of trees, and from these a lateral goes to each tree. At the end of each lateral is a vertical pipe that extends up the trunk to the lower branches. This pipe is capped with a spring valve that is closed normally but opens readily when the air in the pipe is under pressure. When heat is to be supplied to the orchard the air compressor is first started, the compressed air passing through the coils of the heater and then to a storage tank. When the pressure in the tank has been raised to the right degree to open the valves in the vertical pipes and give the escaping air a spray effect, the valve connecting with the pipe system is opened. The compressor and heater are then kept going until all danger of frost has passed. One of the advantages in this system is that there is no smoke or odor.

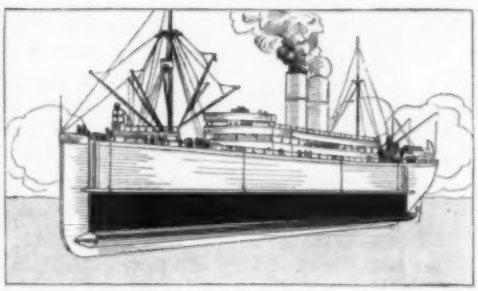


Orchard in Southern California Equipped with Hot-Air Heating Plant

## CURIOUS PLAN FOR CLOSING HOLE IN SHIP'S HULL

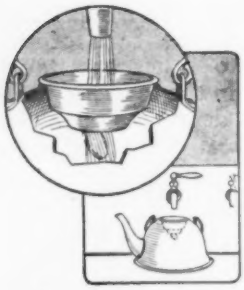
Water-tight curtains carried on rollers in recesses in the keel of a ship and arranged to be drawn up over a leak or a hole in the hull are the basis of the most curious of recent inventions relating to safety at sea. The plan is to have one curtain on each side extending the full length of the ship, and to each curtain lines are attached running up to drums on the deck. To a stiffening beam fixed to the free end of the curtain, blocks are attached that are intended to run in slot ways in the side of the ship and guide the curtain as it is raised.

The invention was apparently suggested by a plan occasionally resorted to in the days of sailing vessels for stopping leaks, which consisted in dropping a tarpaulin over the bow and then working it back over the leak by attached lines running up the sides of the ship.



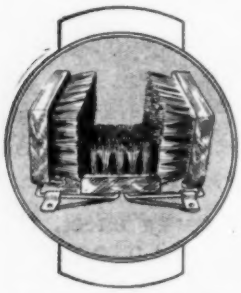
Water-Tight Curtain Designed to be Drawn Up over a Leak or Hole in the Side of the Ship

# NOVEL AND PRACTICAL DEVICES FOR THE HOME



New Style Teakettle Cover

OPENING automatically when water is poured into it, a teakettle cover has recently been invented which affords a place for setting a dish when it is desired to keep its contents warm. A small spring door in the bottom of the concave device is opened by the force of water flowing from a faucet when the container is being filled.



Convenient Shoe Cleaner

By the action of a specially designed spring, a shoe-cleaning device, lately designed, adjusts itself readily to any-size boot. It is intended to be fastened to the flooring of a porch, or put in some similar place where it may be used conveniently during rainy weather. The cleaning is done by moving a shoe back and forth between the brushes.

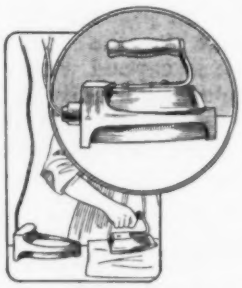
Eye Shade of Novel Form

Designed so that it may be carried in a pocket case if desired, an eye shade has been devised which is made in much the same form as a pair of nose glasses. Two small shades which come close to the brows are secured to a bridge that fits over the nose.

An artistically shaped cruet, intended to be used at a dining table in mixing French salad dressing, is being made in crystal. It is about seven and one-half inches in height and so marked that the proper proportion of vinegar and oil may be poured into it readily without being measured in a separate vessel. After the seasoning is added and the contents of the vial shaken, the dressing is ready for use.

Vial for Salad Dressing

In an attempt to overcome the inconvenience attending the use of an electric iron to which feed wires are attached, a new apparatus has been brought out. In this case the wires connect with a heating standard that holds a switch which turns the current on or off, as the iron is set in place or removed.



Electric Iron without Wires

Fitted with an adjustable lamp that may be turned to various angles, a magazine and book rest has been built with a collapsible brass stand. The rack may be swung from either the right or left side of the standard, as desired, and used beside an armchair or couch, or employed as a music holder.

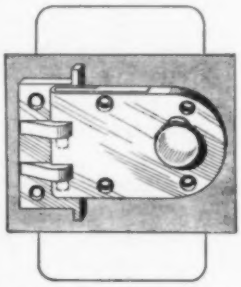
Book Rest and Reading Lamp

Copper tubes, mounted on a ring,

containing hooked rods that may be extended to various lengths, constitute a new fixture that has been introduced in France for hanging heavy oil paintings and other framed pictures. The sliding members when drawn out to the required length are secured by set-screws.

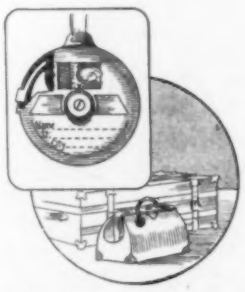
Provided with bolts which slide into vertical sockets instead of horizontal ones, a new lock has been designed which is supposed to hold most strongly when force is brought against it in an attempt to open it illicitly. It is made particularly to resist a burglar's jimmy, which when used against it meets much the same condition as if an attempt were made to force a door hinge by pushing against one side of it.

Picture-Hanging Fixture Which may be Adjusted



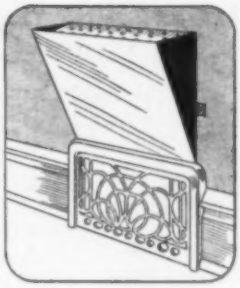
Burglar-Proof Door Lock

Intended to be attached to traveling bags to identify them in case of their loss, a small metal box, bearing the name and address of the owner and containing stamps with which to notify him where his property may be claimed, has been invented in Germany. The device has much the appearance of an ordinary grip tag, except that it is provided with a small lock and carries directions for opening it so that the finder of the lost baggage may obtain the stamps contained within it.



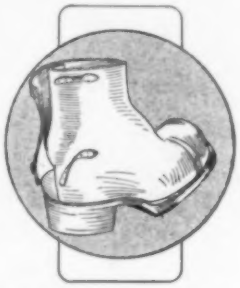
Identification Tag for Bags

Made in the form of a heat deflector for wall or floor registers, a simple device to keep the atmosphere in a furnace - heated room properly moistened has been introduced. It is made of metal, is wedge-shaped, and holds approximately two gallons of water, so that frequent refilling is unnecessary. Perforations in the top provide for the evaporation.



Air Moistener of Odd Form

Application for patent rights has been made by the inventor of a shoe which opens at the back and fastens on the outer side with buckles, dispensing with both buttons and laces. The opening extends upward from the counter.



Shoe Opens at the Back

A baby buggy, now being brought out, is so built as to enable the body to be faced in either a forward or backward position. By means of a foot lever the carriage may also be raised several inches, making it possible for a nurse to attend an infant's needs without bending over uncomfortably.

Reversible Body on Baby Buggy

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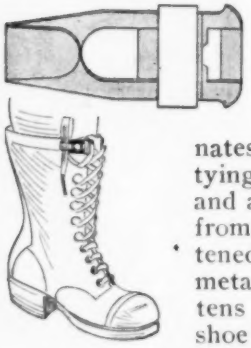
¶Grass-green uniforms have been supplied to the German forces for the summer campaign.

## FASTENING DEVICE IS MADE FOR SHOESTRINGS



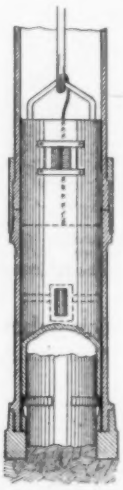
A Pennsylvania inventor has devised a shoe-lace clasp which eliminates the necessity of tying one's shoestrings and also prevents them from becoming unfastened. It consists of a metal catch which fastens at the top of a shoe and holds a string tightly in place. When the device is used the usual method of lacing is altered, one end of the string being looped in the first eyelet of the shoe. A slip catch on the outer side of the clasp holds the loose end of a lace.

## MOTOR CAP WITH GOGGLES BUILT IN

A cap to which is attached goggles that can be folded under the crown and out of the way when not in use is one of the latest conveniences for motorists and golf players. The cap is made in two styles, one for men and the other for women, the latter being so made that it covers and protects the hair. A slight pull brings the goggles into use.

## ELECTRIC CORE DRILL MADE FOR MINE PROSPECTING

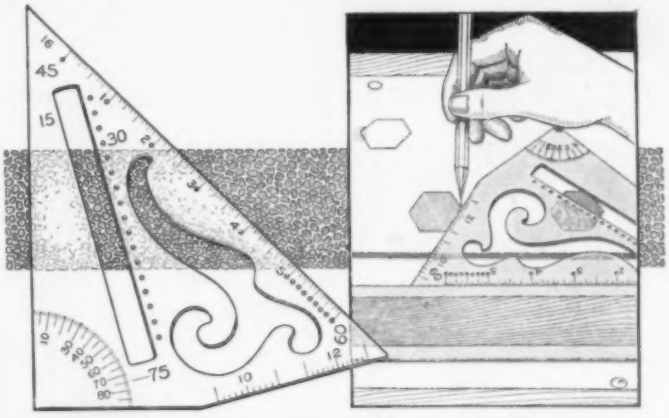
An electric drill for mineral prospecting has been invented which is fitted with a core-lifting mechanism so arranged that the core may be raised independently of the drill tube. This latter member, as in similar drills, consists of a series of hollow rods, each section of which is from 5 to 10 ft. in length and lap-jointed. In the new drill it is only the bottom segment of this tube which is rotated, which eliminates the drag and permits the diamond bit to revolve at high speed, regardless of the depth at which it is cutting. This is possible because all of the driving mechanism is contained within the drill rod and operated electrically, instead of the casing being driven, shaftlike, by power applied at the surface of the ground. The core-lifting mechanism itself is not different from what is ordinarily used, except that it is raised or lowered within the tube by means of a steel cable instead of requiring the drill rods to be hoisted out of the bore. In other words it is not a fixed part of the drill. The cable is attached to the stator, containing an electric motor and automatic clutch, which is maintained in proper alinement by roller bearings which separate it from the revolving drill pipe. The electric wires leading to the motor are also incased in the hoisting line. The chief advantage of the plan is that less time is consumed in removing the cylindrical core as it is cut. This is ordinarily done about once for each 10 ft., and the time consumed in this operation, which includes the replacing of the rods in the bore, is about equivalent to the time actually spent in drilling. This time consumption is materially lessened by the new drill, the work is done more quickly, and the cost thereby greatly lowered.



¶ Parrots are much disturbed and screech loudly upon the approach of aeroplanes. Attempts are being made in Europe to use them as aerial sentinels.

## COMBINATION INSTRUMENT FOR DRAFTSMEN

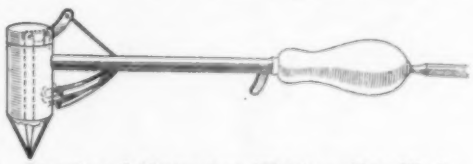
By the use of a transparent triangle of special form, recently placed on the market, a draftsman is enabled to perform many of the operations that formerly required special instruments. When the triangle is worked against a straightedge, angles of 15°, 45°, 60°, 75° and 90° may be laid out with the sides alone. With the ordinary triangle only three angles can be laid out in this way. By using the sides of the long slot in combination with two of the sides, angles of 15° and 30° may be drawn, while any angle less than 90° may be laid out to the nearest degree by means of the protractor placed in one of the corners. In addition to the slot cut into the triangle there is also an irregular, or "French," curve, an instrument that is used frequently in certain kinds of drafting. The long side of the triangle is graduated to inches and sixteenths. At each inch mark there is a perforation, while the sixth inch is perforated at each eighth-inch mark. By placing a pencil point through one of the perforations and rotating the triangle around another perforation held by a pin point, it is possible to draw circles with radii of from ⅛ in. to 6 in. On one side the division of an inch into tenths and twelfths is also given. Parallel with the slot is a series of perforations placed ¼ in. apart. These are used for drawing closely spaced parallel lines by working a pencil point through successive perforations and sliding the triangle against a straightedge.




By Using This Instrument Alone a Draftsman is Enabled to Perform Many of the Operations That Formerly Required Special Instruments

## AUTOMATIC SOLDERING IRON NEW TOOL FOR TINNER

Intended for use in shops where a large amount of plain soldering is done, a new iron has been devised which performs much the same function for the tinner that a fountain pen does for one who is continuously writing. The tool is fitted with a hollow, projectile-shaped head that serves as a melting pot for the metal and is mounted at right angles to the handle. The solder is fed through a small hole in the point of the iron, the flow being controlled by a plunger within the receptacle. This is actuated by a lever, rod, and spring mechanism which is governed by a trigger placed near the grip. While the heating may be done electrically, gas or gasoline is ordinarily used as fuel. The burners placed at one side of the iron keep the latter hot and the metal within it melted so that it flows readily.

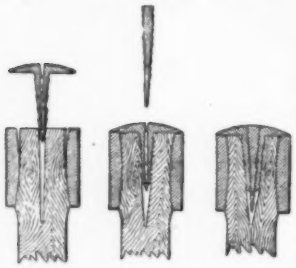


Ingenious Soldering Iron Which on Plain Work Saves Much of a Workman's Time

¶It is reported that a French firm is manufacturing an excellent cement from the scum formed in boiling beets in the process of making sugar.

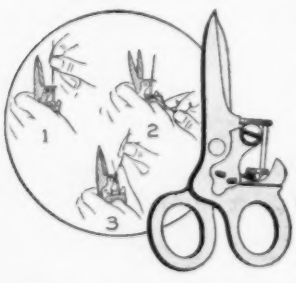
## EXPANDING WEDGE FOR TOOL HEADS

A new wedge for holding the heads of hammers and other tools in place consists of a pair of tapered side plates pinned together at the thin ends for convenience in fixing, and a central wedge used in expanding the side plates. The inner and outer faces of the side plates and both faces of the wedge are serrated, so that slipping is prevented. In applying the device a saw cut is made in the end of the handle, the head of the tool is placed in position and the pair of side plates is driven in far enough to give the flanges a firm bearing on the end of the handle. The central wedge is then driven between the side plates. This breaks the pin holding the side plates together, and the driving is continued until the wood of the handle is wedged out and completely fills the hole in the tool head.



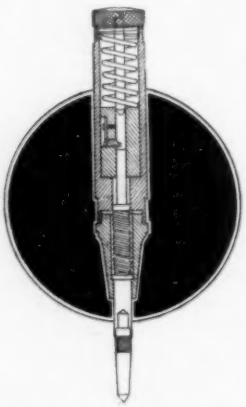
## NEEDLES THREADED QUICKLY BY NOVEL SCISSORS

Eliminating the difficulty ordinarily encountered in threading fine needles by performing the operation mechanically in a few seconds, an instrument is being used which also serves as work-basket shears. It is approximately the size of most buttonhole scissors, but has a small tube on its upper side, which, when the shears are closed, admits a needle. By slowly opening the blades in the ordinary manner the needle is automatically adjusted so that a hook is passed through its eye, extending entirely through the tube, so as to receive the thread. By then closing the instrument, the hook is withdrawn, pulling the thread through the needle



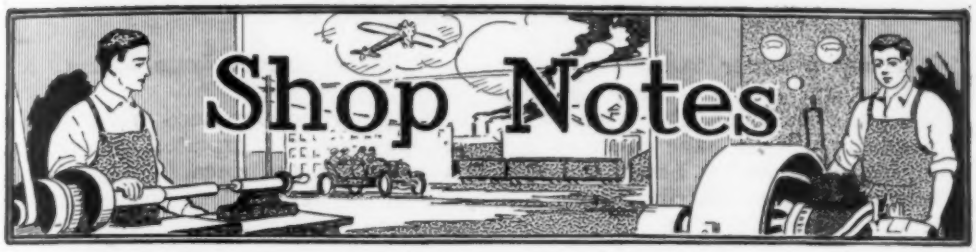

## CENTER PUNCH THAT STRIKES BLOW AUTOMATICALLY

A new time-saving device for metal workers is a center punch that strikes a blow automatically when pressed against the metal, thus relieving the workman of the necessity of holding the tool in place with one hand while he reaches for a hammer with the other. With the tool in place the top or handle is pressed down. This compresses a spring within the casing, and at the end of the movement a trip releases the spring, which expands suddenly against a small hammer and causes it to strike a sharp blow against the top of the punching tool. The entire mechanism is contained within the casing, the tool having much the appearance of an ordinary center punch.



## PART OF GOVERNMENT'S OIL SUPPLY STOLEN

That most of the oil in the government oil fields of California has already been taken by private parties contrary to law is the substance of a report recently made to the Navy Department, and prosecutions are to be instituted if sufficient evidence can be obtained against the offenders. These oil fields form part of the oil supply reserved by the government for the use of the navy in case of emergency.




### Powdered Wax for Ballroom Floors

To make a powdered wax for a ballroom floor, melt in benzine as much wax—paraffin will do—as the liquid will take up, then stir in some talcum powder to form a fairly stiff paste. Rub this through a No. 1 sieve, then spread it out thinly on trays to permit the evaporation of the benzine. Be careful to keep it away from a flame. When the mass has become perfectly dry, pulverize it and place in tin cans with perforated tops. Use it by sifting the powder on the floor. — Contributed by A. Kelly, Malvern, Pa.

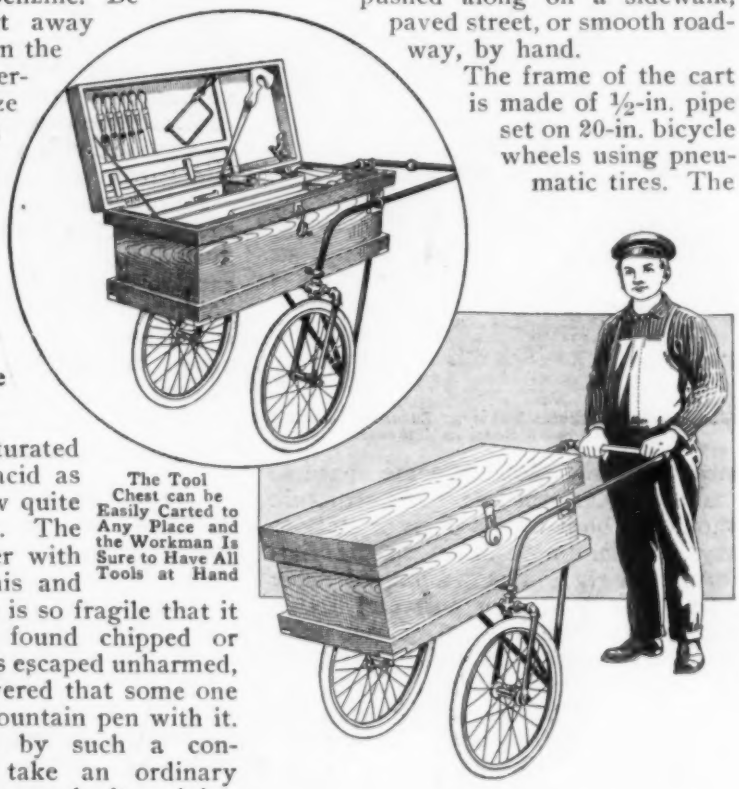
### An Emergency Eye Dropper

The value of a saturated solution of boric acid as an eye-wash is now quite generally known. The small glass dropper with which to apply this and other eye remedies is so fragile that it is nearly always found chipped or broken; and if it has escaped unharmed, it is usually discovered that some one has been filling a fountain pen with it. When confronted by such a contingency, simply take an ordinary drafting or ruling pen, and, after wiping it clean, dip it into the solution and with the points well separated touch the moist eyelid, which will instantly cause the liquid to flow in.—Contributed by John D. Adams, Phoenix, Arizona.

### A Carpenter's Tool-Chest Cart

In my carpenter work I have many odd jobs, which makes it necessary to call a drayman for hauling the chest of tools each way, and this added expense on small jobs makes them unprofitable. To eliminate this expense I constructed a tool-chest cart that can be easily pushed along on a sidewalk, paved street, or smooth roadway, by hand.

The frame of the cart is made of ½-in. pipe set on 20-in. bicycle wheels using pneumatic tires. The wheels are set far enough forward so that there is considerable weight on the post at the rear when standing still. When lifted, the handle is of convenient height for pushing, and it balances well on the wheels.



The Tool Chest can be Easily Carted to Any Place and the Workman Is Sure to Have All Tools at Hand

It is much easier to push the cart than to carry a few tools in a hand box on the shoulder, and when I arrive at the work I have everything I need, including screws, brads, and nails of various sizes.—Contributed by Sim Goddard, Sheridan, Wyo.

### A Floating Boat Landing

Where the tide rises and falls the float shown makes a convenient landing for a small boat. Four posts are set, one at each corner of a suitable-

**The Floating Platform Makes an Excellent Landing Place for Small Boats in Tidewaters**

size platform, allowing some space to make the platform free. The structure should be built near a dock or stationary high landing. Make up the platform strongly and bend a loop of heavy iron rod around each post and flatten the ends for bolt holes. Drill two holes in each end for bolts and fasten them to the platform.

Steps, or a stairway, are constructed and hinged to the dock so that the lower end will rise and fall with the movements of the platform.—Contributed by Fred L. King, Islip, N. Y.

¶When mounting an emery wheel, tap it lightly to see whether it is sound or cracked.

### Easily Made Name Plates

Brass or copper-faced name plates for machinery, doorplates, etc., can be made easily and cheaply as follows: Set up the desired lettering in rubber, or metal, type and make a plaster-of-paris impression. Then inclose it in a small frame the size of the desired plate and $\frac{1}{16}$ in. deep. Use either copper or brass filings for the facing material. These must be thoroughly washed in soldering flux and allowed to dry, after which they are well sprinkled in the impression left by the type.

Fuse a compound of seven parts lead to three parts of block tin and pour it into the open mold. When the metal becomes a little cool, but is still soft, press it with a flatiron, or a similar object, to force the metal well into the corners and to remove all air. When cool remove carefully, trim and finish on the face with a piece of emery cloth laid flat on a board.

Before pouring, or before applying the filings, the mold should be carefully dusted with black lead. If this precaution is not observed, the mold is liable to be damaged when the casting is removed. If only one plate is to be made, this caution need not be considered.

### Spring Shock Absorber for Crutches

The jarring experienced when using crutches can be greatly reduced if spring shock absorbers, as shown in the illustration, are fastened at the bottom. The device consists of a metal tube, open at both ends, but provided with a solid partition in the center. The lower end contains a shock-absorbing spring, and a loosely fitting reciprocating plug, to one end of which is attached a rubber tip, while the other end is provided with a stud, threaded on the end for an adjusting nut. The partition should be drilled to fit the stud. With spring and plug in place,

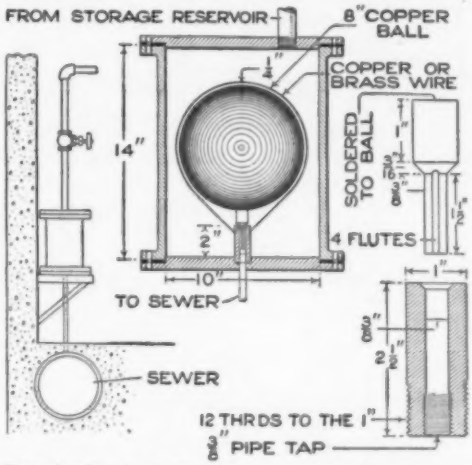
the nut should be put on, and the spring adjusted for the desired amount of compression. The shock absorber can then be fastened on the crutch with a small bolt and nut, allowing sufficient clearance between the end of the crutch and the top of the reciprocating plug, so these will not strike together.—Contributed by M. Morris, Toronto, Canada.

### Automatic Condensation-Discharge Trap for Compressed-Air Tanks

Considerable difficulty was experienced from water condensation in the compressed-air tanks passing up through the return pipes and into the pneumatic tools that were used in the shop. A large number of such tools as motor drills, pneumatic hammers, etc., were used by the men in the erecting shop, and the presence of water in any of these tools did not take long in making itself known, which caused damage to the sensitive parts. As the condensation of water in any like case is irregular, depending on the condition of the atmosphere drawn by the compressors, it is hard to keep a tank drained and free from water at all times.

The sketch is descriptive of the manner in which an automatic condensation-discharge trap for this water was inexpensively constructed and operated in connection with the tank and pipe lines. An old 10-in. air cylinder was utilized, with two heads to fasten tightly on the top and bottom. The 8-in. copper ball, or float, pulls the valve from its seat when the water lifts it. When the least amount of air begins to escape the valve is instantly drawn to its seat. The valve seat and guide spindle worked very nicely soldered directly on the copper ball, or float. One of the traps was worked in connection with the large storage tanks and another installed at the end of the air pipe line in the erecting shop.

In the case mentioned the traps at once made their value apparent, for no further difficulty was experienced by the men using pneumatic tools in the erecting shop, and also the automatic draining of the storage tanks relieved

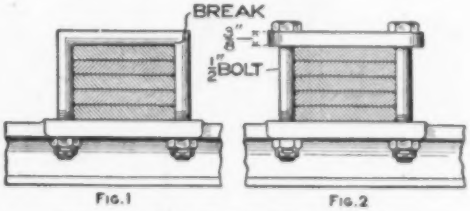



Trap for Use in a Pipe Line or at a Tank to Remove Water from Condensation

the engineer's mind of a matter which had previously been of no little concern.—Contributed by F. W. Bentley, Jr., Missouri Valley, Iowa.

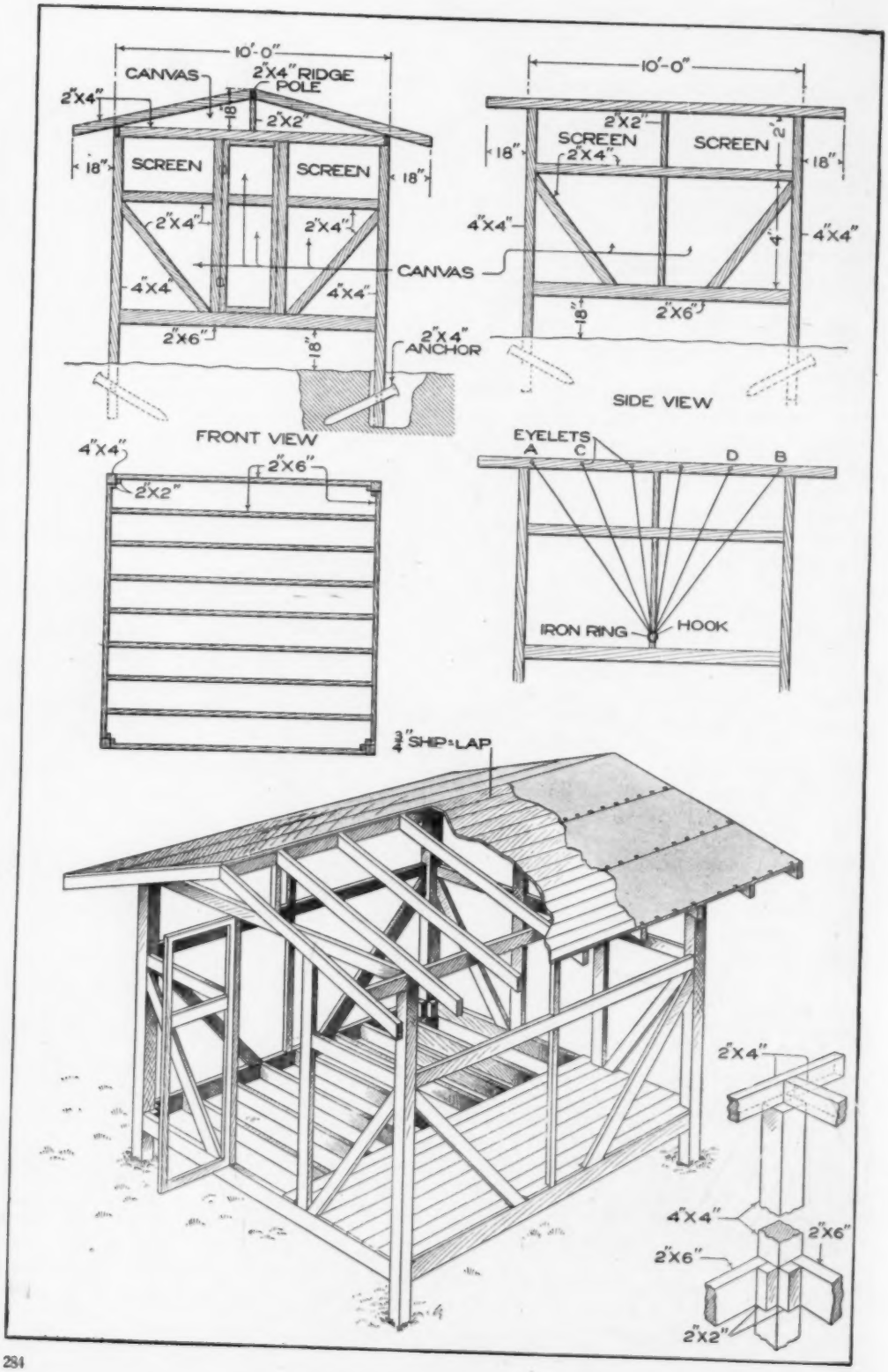
### Substitute for a Broken Automobile-Spring Clip

A clever substitute for a broken spring clip is shown in the illustration. The clip broke at the point indicated in Fig. 1, and to repair it was practically out of the question. A piece of cold-rolled stock, 3/8 in. thick and 1¼ in. wide, was cut to the proper shape to fit over the spring; two bolts of the proper size and length were procured, and the assembling was made as shown




Substitute for a U-Bolt Clip, to Hold an Automobile Spring on the Axle

in Fig. 2. The job was quickly done, and a great deal of time saved, as it would have taken several days to procure a new clip.

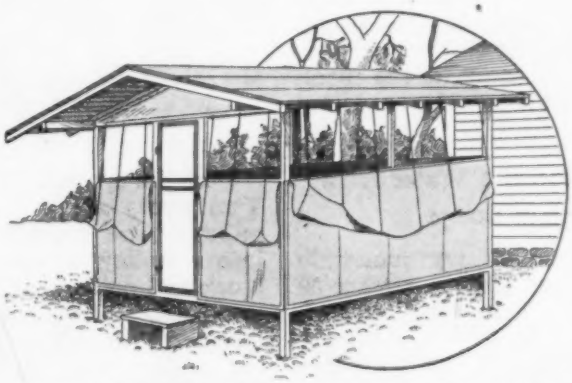

10'-0"
CANVAS
2"X4" RIDGE POLE
2"X4"
2"X2"
18"
SCREEN
SCREEN
18"
2"X4"
2"X4"
4"X4"
4"X4"
CANVAS
2"X6"
2"X4" ANCHOR
FRONT VIEW
10'-0"
2"X2"
SCREEN
SCREEN
18"
2"X4"
4"X4"
4"X4"
2"X6"
SIDE VIEW
4"X4"
2"X6"
2"X2"
EYELETS
A
C
D
B
IRON RING
HOOK
3/4" SHIP-LAP
2"X4"
4"X4"
2"X6"
2"X6"
2"X2"

# A Tent House

By L. P. PASEWALK

THIS tent house, or sleeping bungalow, was the result of an urgent need of a place for sleeping out in the open, which would afford the advantages of a house. It was built in a convenient place in the yard on four posts, 9 ft. long and 4 in. square. These posts were set in the ground in a perfect square, 10 ft. on the sides, and to a depth of about 18 in., then anchored with pieces of 2 by 4-in. material nailed across their ends. Before tamping in the dirt, however, the posts were merely set in the holes dug for them, then the framework was joined to the posts.

The floor sills were first cut to length to fit in between the posts, each being 9 ft. 4 in. long and squared to make a good joint. These were fastened to the posts with toenails, and further strengthened with blocks, as shown in the ground plan. At a point 4 ft. above the sills, pieces of 2 by 4-in. material, in the same lengths and attached in the same manner, were placed between the posts.



The Tent House Has All the Comforts of a Home and the Advantages of Sleeping in the Open Air, Protected from Rain and Bad Weather

The plates for the rafters to rest on consist of 2 by 4-in. material, set on edge so that their outside surfaces were flush with the outside of the posts, two pieces being 13 ft., and two pieces, 9 ft. 4 in. long.

The rafters were cut from 2 by 4-in. material, 6 ft. long, this length being sufficient to cut the angles on the ends to make the fit at the ridge. Studs were set in at one end to provide an opening for the door, which was merely a frame covered with canvas.

After the framework was fastened together solidly, the dirt was tamped into the holes about the posts.

Sheathing boards were laid closely together on the rafters and prepared-roofing material placed on them. The sides were covered with canvas up to the noggin, or rail, set in 4 ft. from the sills. An ordinary floor was laid on the joists, set in between the sills. The 2-ft. space above this point was left open, except that it was covered with screen, and an adjustable covering, operated by cords, provided a means of closing up one or all of the openings at will, the several cords controlling one covering being operated by one common point at a ring.

The arrangement of this covering is shown. It was constructed of canvas, of a size to fit the opening, fastened to the lower edge of the rail and allowed to hang down on the outside. The cords controlling the coverings, or flaps, were attached to the loose end of the canvas and run through eyeleted holes in the plate. The cord from A runs to a ring, then to B; from C to the ring and to D, and so on. When the ring is drawn down and hooked over a nail at the bottom on the inside, the flap is pulled up over the screened opening.

This made an excellent sleeping place, like a tent and outside, yet it provided a comfortable place when a storm came up during the night.

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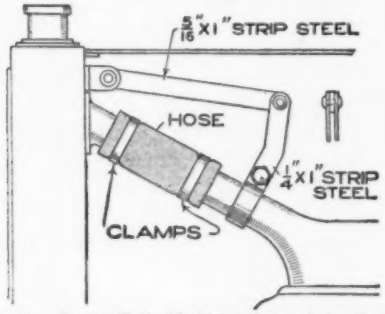
¶If an automobile is left standing in a garage for any length of time, raise the axles on supports to remove the weight from the tires. Weight flattens the tire in one place, causing a crease in the fabric which weakens it to some extent.

### Support for Hose Connection between Engine and Radiator

In certain types of automobiles the radiator is supported at the top by the rubber hose which connects the manifold to the radiator. The constant vibration of the radiator and its forward and backward movements are all imparted to the rubber hose with the result that it becomes badly warped and twisted, and it does not take long before the hose is useless. Trouble of this nature can be eliminated to a great extent by introducing a connection between the radiator and manifold so that the latter, being made of cast iron, will more readily stand the strains than the rubber hose. A piece of steel is firmly clamped to the manifold and is in turn connected to the radiator by another piece of steel. Such a connection is very flexible and therefore is capable of withstanding high strains and vibrations.



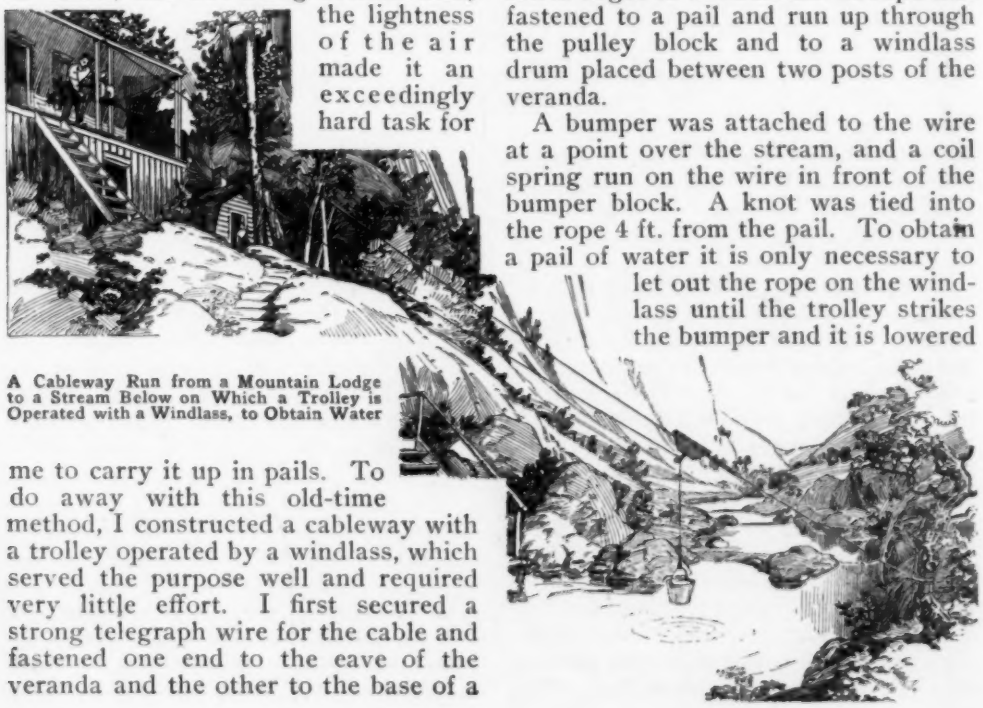

Supporting Bar to Take Up Vibrations of the Radiator to Prevent Strains on the Hose Connection

¶A shaft bearing will take only so much oil, and it is a waste to use more.

### Cableway to Procure Water for a Mountain Lodge

The water used in my mountain lodge was procured from a stream 50 ft. below, and not being acclimatized, the lightness of the air made it an exceedingly hard task for me to carry it up in pails. To do away with this old-time method, I constructed a cableway with a trolley operated by a windlass, which served the purpose well and required very little effort. I first secured a strong telegraph wire for the cable and fastened one end to the eave of the veranda and the other to the base of a tree at the opposite side of the stream. Two pieces of board and two old iron pulleys were procured and fashioned into a trolley to run on the wire. A block and pulley was then hung to the lower edges of the boards. A rope was fastened to a pail and run up through the pulley block and to a windlass drum placed between two posts of the veranda.

A bumper was attached to the wire at a point over the stream, and a coil spring run on the wire in front of the bumper block. A knot was tied into the rope 4 ft. from the pail. To obtain a pail of water it is only necessary to let out the rope on the windlass until the trolley strikes the bumper and it is lowered



A Cableway Run from a Mountain Lodge to a Stream Below on Which a Trolley is Operated with a Windlass, to Obtain Water

into the stream until filled. When the windlass is turned the pail is drawn up until the knot strikes the pulley block, and then it travels up the cableway until it can be taken in by hand.—Contributed by P. E. Ogilvie, Glace Bay, Cape Breton.

### Cutting Tool for Packing

To cut packing in some of the shapes necessary for gasoline-engine heads is quite a difficult task. The irregular shape can be easily cut by the use of two tools, made similar to the regular cold chisel, as shown in the illustration. The tools are forged just like making a cold chisel, after which the flattened edge is made rounding on a ⅜-in. radius for the larger tool and a 3/16-in. radius for the smaller, the widths being 9/16 in. and ¼ in., respectively.

The large one will cut out circles or holes, of any shape, from 9/16 in. up;

The Curved Edge of the Chisels Makes It Easy to Cut a Curved Opening

and the small one from ¼ in. to 9/16 in. in any kind of packing.—Contributed by John P. Kolar, Ithaca, N. Y.

### A Homemade Cradle

The cradle illustrated has all the advantages of any rocker cradle, and besides it is much easier for the mother to take the baby from it while lying in bed, as the supports run under and cause the basket to tip toward the bed.

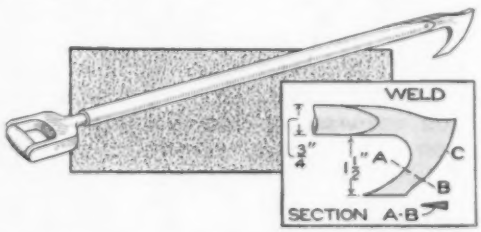
It is constructed of a clothes basket, several pieces of ¾-in. pipe and 2 two-way side-outlet tees. The standards are 38 in. long, ornamented on their upper ends with brass bedpost balls. The spreader is 44 in. long. Each extension for the supports is 13 in. long, bent as shown, and fitted with a caster on the lower end. About 6½ in. from the upper ends of the standards holes are drilled and hooks fastened by riveting the ends of the hook material. These hooks hold the ends of the ropes

A Clothes Basket Swung between Standards Made of Gas Pipe for a Cradle

attached to the sides of the basket. The inside of the basket is upholstered, and the whole frame and basket is given a coat of white-enamel paint.

### Tool for Removing Old Tin from Roofs

An effective tool for removing old tin from roofs can be made from a piece of steel and a 3-ft. length of ¾-in. pipe. The steel is formed into the shape of a hook and welded to one end of the pipe, the other end being fitted with a spade handle. To use the tool, the roof is marked off into strips, about 10 ft. wide, with a chalk line, and the hook is pulled along on the line, cutting up the tin into large sheets ready to be rolled up. When a soldered joint is

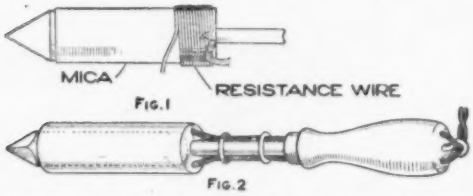



Tool for Cutting Old Tin Roofing into Strips So That It can be Rolled

encountered the workman strikes the boss C with a hammer to drive the blade through it.—Contributed by Wilbert Bernhardt, South Bend, Ind.

### Electric-Heating Coil for an Ordinary Soldering Iron

An ordinary soldering copper may be easily converted into an electrically heated one by placing a heating element about the body of the iron. Proper means, of course, must be provided for




A Coil of Resistance Wire Built Up about an Ordinary Soldering Copper for Heating by Electricity

connecting the heating element to a source of electrical energy. The size and amount of wire for the heating element will depend upon the degree of heat required and the weight of iron being heated. A soldering iron weighing about 2 lb. is a very common and useful size, and it will be assumed that such an iron is to be supplied with a heating coil.

Place several thin layers of mica, about .002 in. in thickness, around the body of the iron, and fasten it in place temporarily with several turns of small wire. Procure 20 ft. of No. 26 gauge nichrome resistance wire. Attach one end of the resistance wire to a piece of asbestos-insulated copper wire, of at least No. 16 gauge and about 15 in. long. Anchor the junction of the resistance wire and copper wire to the soldering iron a short distance from the end nearest to the handle, making sure they are well insulated from the metal part of the iron. Wind the resistance wire around the iron, separating the various layers from each other, to within a short distance of the other end of the iron, as shown in Fig. 1. Place a layer of thin mica around the iron and wind on another layer of the resistance wire in the reverse direction from the first layer. This will give a noninductive winding, or one that can be used on either a direct or alternating-current circuit. Continue in this manner until all the resistance wire is placed about the iron, and then attach a piece of copper wire to the outside end, just the same as for the inside end. A layer of mica is then placed on the outside of the completed winding and fastened with several turns of wire.

The iron is now ready for a trial test, and this should be made before proceeding with the construction. Connect the free ends of the two pieces of copper wire to the terminals of a 110-volt circuit, and allow the current to flow through the iron for four or five minutes. If the iron becomes too hot, the resistance of the heating element is not high enough. If it does not heat up sufficiently, its resistance is too large. To decrease the temperature, add more resistance, and to increase it, remove some of the wire. If either of these changes is required, it must be made before the iron is completed.

The mica covering will not stand very much rough usage and a protection must be provided for it. A cover for the mica can be made from a piece of thin sheet iron, formed into a tube of proper length and diameter to completely envelop the heating element over the mica insulation. The joint in this tube is formed by bending the edges together. Two holes are drilled lengthwise through the handle for the copper wires attached to the heating element. The free ends of these copper wires are soldered to the ends of a piece of lamp cord. If the holes in the handle are drilled large enough, the joints where the copper wires are attached are placed within the handle. A screw eye is fastened in the end of the handle, into which the lamp cord is anchored to prevent any strain coming on the wires attached to the heating element. In Fig. 2 is illustrated the completed iron.

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### Temporary Reflector for a Headlight

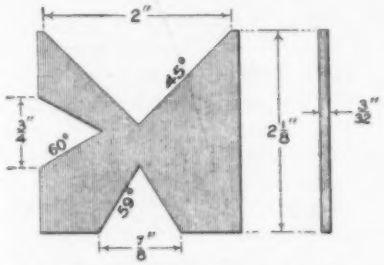
New reflectors or lenses for automobiles are seldom found in stock, and when one is broken, a lamp may be useless for some time before replacement can be made. For temporary

service, cut out a disk of bright tin of the proper diameter, insert it and hold in place with small wedges. A bright bottom from a nonfluid-oil pail will do as well, if one is at hand. A prevention is better than a cure, and barring accidents, broken lenses usually are caused by the flame being blown backward by a leak around the door. The owner should occasionally examine the fit of the lamp doors and see that they are tight.

### A Grinding Gauge

A very efficient and easily made grinding gauge for tool and gauge grinders can be made from a piece of machine steel, 2⅛ in. square by 3/32 in. thick. The 60° angle is for grinding or turning lathe centers, and similar work. The 59° angle is for drills, countersinks, center drills, etc., while the 45° angle gives the correct slope for the chamfers on reamers and taps.

The 45° angle should be large, as shown, so that reamers up to 2-in. may be gauged. The surface forms a square

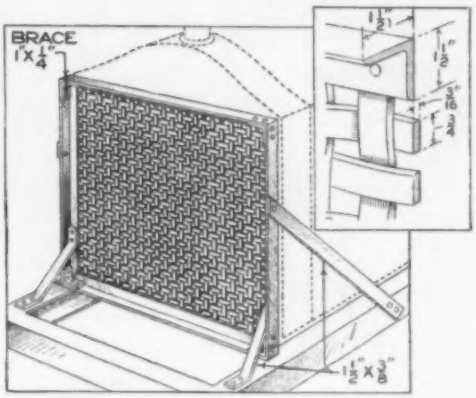



Gauge for Toolmakers and Grinders to Determine the Proper Angles for Tools

and also a straightedge for showing clearance. This tool, unlike protractors, is always set and never slips.

### Screen for a Motor-Truck Radiator

Radiator accidents of a serious nature usually can be avoided by providing a protecting screen. The one illustrated is inexpensive and is readily attached to a truck frame in front of the radiator. It consists of an angle-iron frame with a screen made of strips of metal, ¾ in. wide by 3/16 in. thick. The entire frame is held firmly to the truck frame by means of four braces,




A Protecting Screen Made of Steel Strips to Avoid Serious Damage to Truck Radiators

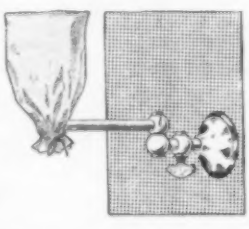
two on each side, all made of flat steel 1½ in. wide and ⅜ in. thick.

### Iron Cement for Steam Pipes

To make a permanent cement to be used for stopping leaks in steam pipes, where calking or plugging is impossible, mix black oxide of manganese and raw linseed oil, using enough oil with the manganese to bring it to a thick paste. Apply this to the pipe joint or leak. It is best to remove pressure from the pipe and keep it sufficiently warm to absorb the oil from the manganese. In about a day the cement will be as hard as the pipe.

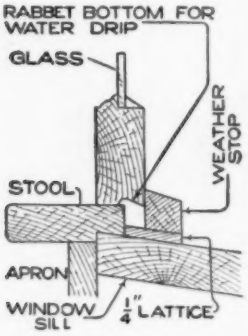
### Protecting the Gas Mantle

"One fly-power" is not much force, but when these pests make a thoroughfare of the gas chimney the incandescent mantle is liable to suffer breakage during the procession. To avoid this, slip a paper bag over the chimney and secure it at the bottom with a rubber band. This will effectively shut out the flies and keep the chimney clean as well.



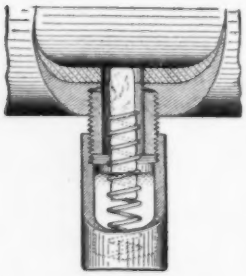
### Waterproof Joint for a French Window

To make a French or swing-in window strictly waterproof, set the stool in so that when the window is hung, it will project out over the stool about ⅜ in. Make a weather stop, ⅞ by 1 in., beveled on top to shed the water, and as long as the window is wide. Procure some pieces of ¼ by 1¼-in. lattice, about 1¼ in. long, and fasten them with nails on top of the window sill just outside of the stool. Nail the weather stop on top of these pieces, and any water that gets in between it and the window will run off the drip formed by the V-shaped notch, or rabbet, in the bottom of the window, down the weather stop, and out under it. This makes the window waterproof in any storm.—Contributed by Bert Fish, E. Rochester, N. Y.




### Oilers for a Small Dynamo

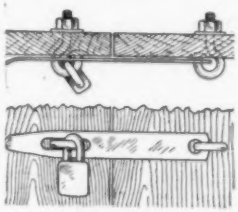
A dynamo installed for lighting only in an automobile had no provision for oiling except an oil hole in each journal. The owner neglecting the oiling, frequent trouble occurred from hot bearings, which finally had to be renewed. To prevent this semi-annual expense, a pair of self-feeding oilers were made as shown. The lower side of the frame and the bushing were drilled and tapped, and a piece of ⅜-in. brass was screwed into the hole. This piece of brass was threaded on the projecting end and had a 7/32-in. hole drilled through it. A piece of 7/16-in. brass was tapped to screw on the outside of the projecting plug and drilled out for almost its entire length. This gave an oil-storage space.



To carry the oil to the shaft, a piece of belt leather was shaped to make a sort of round pin, 3/16 in. in diameter. This was screwed into a light compression spring which kept it constantly up against the shaft and its lower end dipped into the oil. While the leather did not act as a wick, it served the same purpose and carried up sufficient oil to the shaft to keep it well lubricated. Filling was only necessary at long intervals.

### Substitutes for Staples to Hold Door Hasps

The ordinary hasp for a door attached with staples does not provide a very secure fastening when used in connection with a padlock. A much safer holding device than the staples is obtained by the use of carriage bolts. The bolts are bent, as shown, the threaded end is run through the door, and a nut is turned on the threaded end. The bolt cannot be pulled out like a staple.—Contributed by Chas. H. McElroy, Indianapolis, Indiana.



### Using Glass to Grind Glass

It is not generally known that glass will cut glass. If a little work on smoothing the edge of some glass object is desired, procure a circular disk of glass, such as a round eyeglass or watch crystal, and mount it as follows: Turn a wood base to fit in the chuck of a jeweler's, or other, lathe and fasten the glass with the concave side against the wood by using some shellac as a cement. If it is properly centered and made to revolve rapidly, the edge can be used to grind and smooth other glass pieces.

# BUILDING A HOME

By Geo. M. Petersen

## PART V—Lath and Plaster

PRESENT-DAY plastering is known as one, two, and three-coat work. In some localities two-coat work is termed "skim coat." Plaster may be applied over wood or metal lath, or applied directly to the surface of hollow tile, or concrete blocks.

One coat of modern patent plaster is superior to the old three-coat work so far as durability is concerned, although the surface cannot be finished smooth and it dries out a cement gray. Patent plaster is composed of gypsum, cement, hair, and sand, ready to mix and apply. It can be finished so as to appear well by applying a coat of white finish over it. This white finish is put on as thin as possible, evens up the little imperfections on the patent plaster, and leaves the whole wall white instead of a gray. It is because the white finish is put on so thin that it is called "skim-coat" work.

Two-coat work is put on in the same manner as a skim coat, but the finish coat is fairly thick instead of being merely skimmed on.

Three-coat work, as its name indicates, is put on in three coats, the first one being the "scratch" coat; the second, the brown coat, and the third, the white coat, skim coat, or finish.

The scratch coat is always rich in lime and hair, while the brown coat is mostly sand with a little lime and hair added. The finishing coat is usually composed of lime putty and beach sand, in equal parts. This coat may be given a sand finish—a coarse finish resembling sandpaper—by using a coarser sand and a larger percentage of it for the smooth finish. The sand finish is usually troweled down with a wood, or cork, float.

"Hard-finish" plaster generally means a composition of lime putty and plaster of paris, and sometimes marble dust. Hard plaster is often used to imitate Keen's cement for wainscot work in bathrooms and kitchens, and for similar uses.

The important part of plastering which the owner should watch is that all lime used is well slaked. If the lime is not properly slaked, it will cause discoloration of the paper or paint placed over it, and will also cause hair checks in the finish surface. Lime should be mixed not less than four days before using, and some authorities claim that seven days is the proper time.

The cost of plaster varies considerably with conditions, such as spacing of lath, thickness of plaster, wood or metal lath, etc. If wood lath are spaced more than $\frac{1}{4}$ in. on ceilings, or more than $\frac{3}{16}$ in. on the side walls, more plaster is forced in between the lath than is necessary to key it, and considerable waste occurs. The cost of lath and plaster is about 25 cents per square yard for one-coat work; 28 cents, for skim-coat; 32 cents for two-coat work, and 36 cents for three-coat work. The prices on metal lath are

about 15 cents per square yard higher. Wood lath should be well seasoned, free from sap, bark, and dead knots. Bark on lath is sure to stain the plaster, and hard pine is too full of pitch for a really good job. All lath should be 4 ft. long, and never be run from one room to another, or behind partitions. The best lath is made of white pine, spruce, hemlock, or fir.

The durability of plaster is pretty well known to the average person. When it is put on with sufficient force to insure good, strong clinches, it will stand up for years. Plaster, however, will crack readily from concussion, or a sharp vibration of the wall, or dampness may loosen the bond and allow it to drop from the lath. Because of this tendency of the plaster to drop from the lath upon the slightest provocation, there are several manufacturers who are making wall boards with more or less success.

Good wall board is gaining considerable favor, but many products of a cheap grade have discouraged the sale a great deal. They may be divided into three classes. The first one is boards made from news stock and refuse material, and as they are made of cheap stock they do not stand up under ordinary conditions, and the material used is decidedly insanitary as well as presenting a surface which is not adapted to a good paper or paint decoration. Many of these inferior wall boards are put together with tar, asphalt, pitch, and similar materials, which are very inflammable and therefore impractical for walls and ceilings.

The second is boards made of a combination of wood fiber, pulp, and news stock. Generally speaking they have the same disadvantages as those mentioned in the first classification, inasmuch as they have not the strength or durability necessary to give lasting satisfaction. Many of these boards have a center made of news stock and refuse material with the outer layer of wood fiber. The fibers used are generally short and hard and they are easily affected by outside conditions. There are other boards made up of asphalt and special clay preparations for the center of the panels. In the construction of some boards full-size lath are used as a backing, while others are little more than pieces of ¼-in. yellow pine painted with pitch and covered with strawboard.

The third class comprises boards made entirely of wood fiber, of which there are only three or four on the market. Wall boards, like other building material, are not adaptable to all conditions. A board made entirely of wood fiber will not make a good surface for paper, as it will expand and contract with the atmospheric conditions and cause the paper to crack. On the other hand, beautiful designs may be worked in paint and these are far superior to paper. Tiffany blends and stencils are used to advantage on this class of board, and really wonderful effects can be obtained.

There are also wall boards that are finished to imitate quarter-sawed oak, Circassian walnut, black walnut, mahogany, etc., as well as waterproof boards. Waterproof board can be made, but is unsatisfactory because the surface cannot be painted or papered with satisfactory results, as it is fin-

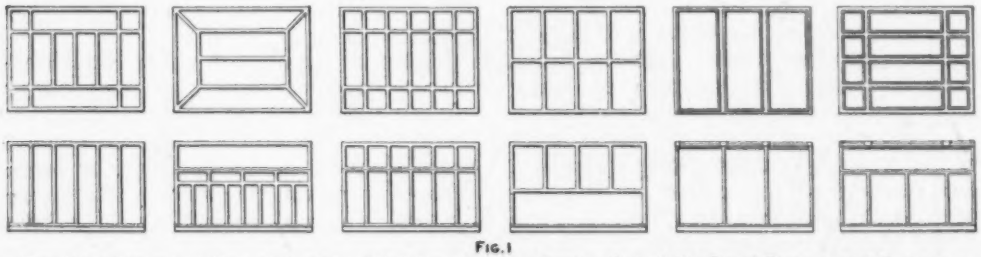


FIG. 1

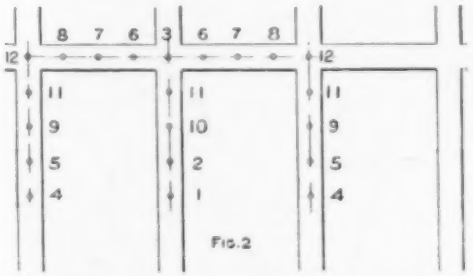
**The Most Important Part of Applying Wall Board Is the Laying Out of the Panel Designs and Fastening Them in Place, as Many of the Failures can be Traced to Improper Installation**

ished with wax. Boards having imitation-wood finishes are not in very great demand.

Perhaps the most important part of a wall-board job is the laying out of the panel design. The illustration shows several wall and ceiling-panel designs. The manner of nailing the board in place is shown by the numbers, which designate the order in which to drive the nails. Most of the wall-board failures can be traced directly to an improper installation of the board itself. Wall boards can be purchased at from $18 to $36 per 1,000 sq. ft., but most reliable boards can be had for $25 to $32 per thousand.

There are hundreds of color schemes and designs which may be used in decorating wall boards, varying from flat color with a plain line border to the most elaborate blends and stipple effects with complicated stencils, as mentioned heretofore. If a little study is given to the panel designs for each room, some really delightful effects may be obtained by using wall boards. Most of the wall-board manufacturers are also making an imitation tile for bathrooms and kitchens. This material, when enameled, resembles tile or Keen's cement very closely and makes a fair job.

Metal ceilings and wainscoting are rapidly coming into favor, although they have their faults as well as other




**The Figures Designate the Order in Which to Drive the Nails for Holding the Wall Board**

building materials. Metal ceilings can be installed for eight cents or more per square foot, according to the design and the amount of labor involved in matching, and the number of offsets and angles to be treated. Metal wainscot can be installed for seven cents per square foot on the bare studding, but to do a good job the space over which the metal is to be placed should be

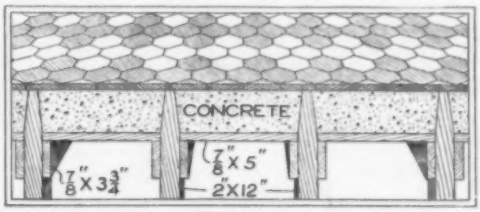



**FIG.3**

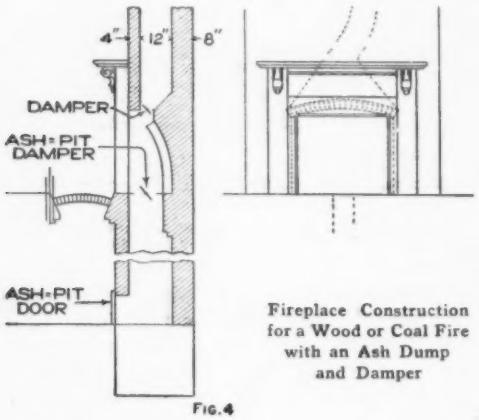
**Concrete-Floor Construction as a Floor Base over Which a Tile Floor is Laid**

sheathed with ½ or ⅞-in. lumber and the metal nailed to this backing. The wood backing not only affords an even nailing surface, but backs up the metal and protects it from dents and corrosion. Metal wainscot is usually finished with a wood base and cap to imitate tile.

Metal ceilings can be given two coats of flat white and one coat of enamel, or it may be tinted to any shade or color desired, using a lead and oil paint, the same as for wood. Metal wainscot, however, is generally enameled white, and the wood cap and base are finished to match the tiling. Inside and outside beads are made so that the corners can be finished neatly. All stamped metal work will rust out in time, but the low cost of renewal overcomes this objection to a large extent.

Tile is undoubtedly the most popular material for bathroom floors and wainscot, but because of the price it is not used in cheaper houses. Tile floors may be laid for from 25 cents a square foot up, with the average price around 60 cents a square foot. The cheaper price means skimping on the base, using a second grade of some cheap tile and naturally a quick job of laying, which means slovenly work. Tile wainscot costs in the neighborhood of $1 per square foot and is laid in cement on metal lath. The wainscot tile should be thoroughly soaked in water before using, then laid to a straight edge and well tamped into place.

The No. 1 grade of tile is clean, smooth, and has a clear color, while the No. 2 grade is slightly off-color, usually a little yellow. The second grade is generally used for servants' bathrooms and pantries, although a




Fireplace Construction for a Wood or Coal Fire with an Ash Dump and Damper

FIG. 4

comparatively small amount of other tile work is laid with seconds. Some of the tile seconds, as well as most of the cheaper grades, are porous and absorbing, so that they really do not meet sanitary requirements.

All tile work should be scrubbed with a solution of hydrochloric acid shortly after the cement has set. This solution removes all stray cement from the face of the tile and leaves it clean. Care must be taken to flush and scrub the tile with clean water as soon as the acid has done its work, or the acid will eat its way between the tiles, which not only results in a bad-looking floor, but will leave cracks and seams that cannot be kept clean.

A gas-burning fireplace is constructed so that the flue runs straight up the chimney, but one burning wood or coal must have the flue start as close to the front of the opening as possible and without any turns. Care must be taken to see that the flues are the same size all the way up, or are even larger at the top than at the bottom, and that no short turns are made in the lining. All fireplaces should be equipped with a damper, ash pit and clean-out door in the cellar, or basement.

Any design desired can be readily obtained, as the range of color, size, and texture of the fireplace brick now on the market is almost unlimited. The mortar can also be colored so that it will either blend with the color of the brick or make a decided contrast. The latter effect is the one most desired at present, and black mortar is the most popular. The hearths are laid either with the same brick or with various kinds of tile, the red "promenade" being very popular. The tapestry and coarse-texture bricks make a very handsome fireplace, but the pressed brick is by far the most sanitary and most easily cleaned, while it is very difficult to remove the dust and dirt from the pores of the coarse-textured brick.

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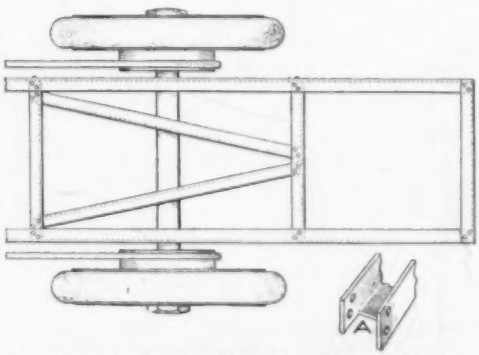
### Reinforcing a Strained Automobile Frame

The frame of a light delivery wagon became badly strained from an accident, so badly, in fact, that some method of reinforcing the rear portion of it became absolutely necessary. It was done in the following manner: Two channel pieces were riveted diagonally between the two cross members directly above the rear axle. The ends were cut out, as shown at A, so that the riveting was done on the upper and lower flanges only. It was surprising how rigid the frame became after these braces were in place.—Contributed by Adolph Kline, New York City.




Braces Put in the Rear Part of an Automobile Frame to Stiffen It after an Accident

## Dividing Tool for Graduating Scales

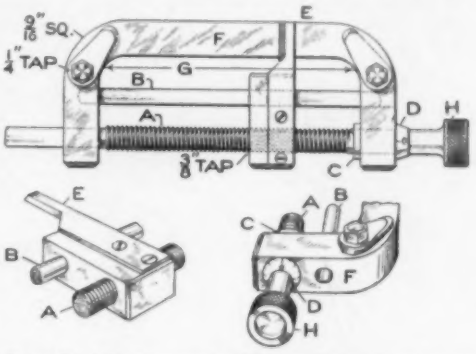
A tool designed for graduating any flat surface in any number of parts, up to 1/64 in., is shown in the illustration. By changing the feed screw and nut to the metric system, graduations for these scales can also be made.

The frame consists of a length of machine steel, 9/16 in. square, drilled for the feed screw A and the guide rod B, then tapped for 1/4-in. clamp screws, as shown. The two collars C and D serve to prevent longitudinal play, and the latter also serves as an indicator, being divided into four equal parts, as shown, and graduated accurately, then marked 0, 1, 2, and 3. The feed screw has 16 threads to the inch, so that one turn makes the marking guide E move 1/16 in., while a half turn moves the guide 1/32 in., and so on. The threads on the screw should be carefully cut and lapped to fit snugly in the threads of the guide E. The beveled face of the collar D being divided into four parts, the screw may be accurately moved quarter turns, thus spacing to 1/64 in., which is usually fine enough for any scale.

While the instrument is small, it will accurately graduate a scale, rule, or tape of any length. In use, the surface to be graduated must be cleaned and coated with copperas, then lines must be made with a scriber lengthwise of the scale, the first 3/32 in. from the edge, the next 1/8 in. from the edge, and so on. Place the work on the frame F, and fasten it down with the clamps G. The marking guide E is run up to the head of the tool and set flush with the end of the scale to be graduated, and the tool is ready.

Give the thumbscrew H one quarter turn, then make a clear scratch on the prepared surface, drawing the scriber along the side of the guide E; give the screw H another quarter turn, and repeat until the whole length is marked. This spaces the marks 1/64 in. When the length of the lead screw has been graduated, return and space a half turn for 1/32 in., and continue so until the scale is graduated as desired.

In case of a long scale, graduate each length at a time, setting the last graduation for the first mark and repeating




**Hand Tool for Accurately Marking Divisions on Scales and Rules of Special Construction**

each operation. With this tool many novel, useful, and accurate forms of scales may be easily made. While this instrument will not compare with machine-made tools of the latest patterns, or with the automatic dividing engines, it is quite rapid and is absolutely accurate.—Contributed by J. B. Murphy, Plainfield, N. J.

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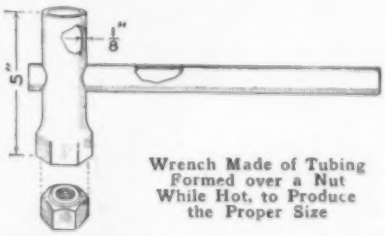
## A Quickly Made Wrench

The illustration shows how a wrench for a hexagonal nut can be quickly made. A piece of ordinary tubing, with an outside diameter equal to the dimension across the flats of the nut and about 5 in. long, is thoroughly annealed. The nut which the wrench is to fit is heated to a red heat, and the tube is hammered down over it to make the shape as shown. The nut will

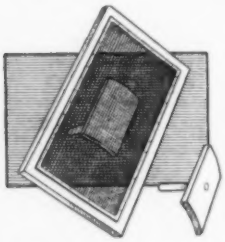



**Wrench Made of Tubing Formed over a Nut While Hot, to Produce the Proper Size**

contract a little in cooling, sufficiently to allow the wrench to slip over it freely. Another piece of tubing is used as a handle.

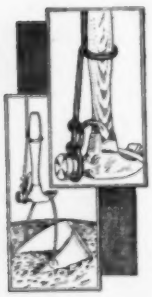
### Painting Wire Screen

Procure a board, about 10 in. long, 8 in. wide, and ¾ in. thick, that is slightly curved as shown. Fasten a piece of round wood, 2 in. in diameter and 6 in. long, to its center on one side for a handle. Hold the board under the screen the same as holding a plasterer's trowel and paint on the upper side, applying the paint quite freely. Allow the screen to stand for a time, then brush dry to remove the surplus paint.—Contributed by J. L. Riley, Dallas, Tex.



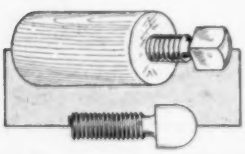
### Makeshift Grabhook for a Well Bucket

As I happened to lose the water bucket from the rope in the cistern and had no grabhook, I managed to get the bucket out very easily as follows: A rope was tied to a claw hammer, as shown in the illustration, which served as a hook that was easily passed into the bucket bail, so the bucket could be drawn out.—Contributed by A. Jaminet, Denver, Colorado.



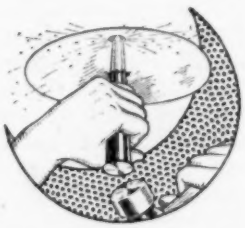
### Handle to Hold Setscrew While Smoothing Head

As it was necessary to smooth down the edges on the head of a short case-hardened setscrew, and I found that a file made no impression on the hardened surfaces, the only other thing to do was to use a grinder. To facilitate holding the screws while grinding I made a short handle of hard wood, bored a hole of sufficient size for the threads to cut their way in, and turned the setscrew into the hole. This held the screw firmly so the grinding could be done with ease.—Contributed by James M. Kane, Doylestown, Pa.



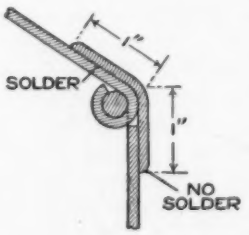
### Protecting the Eyes When Making Hole in Concrete Ceiling

In making some holes in a concrete ceiling for bolts, a millwright experienced considerable trouble with particles falling in his face and eyes. To protect the eyes, a piece of celluloid was slipped over the chisel. This did not obstruct the view or prevent particles from falling to one side.—Contributed by J. J. Kolar, Maywood, Ill.



### Waterproofing Hinge Joints on Automobile Hoods

Automobiles of the cheaper grades, of which there are many, never are supplied with a covering on the hood hinges to keep out the rain. This trouble may be overcome by placing a bent strip of metal over the hinges, the upper part being soldered to the top of the hood while the lower part is bent to form a close fit with the vertical side, but left unsoldered to permit the opening of the hood.




¶Prestolite gas run too low for lighting the lamps can be revived temporarily to finish a run by heating the tank, which releases some of the gas from the absorbent.

### Reading Performance Curves of Motors and Generators

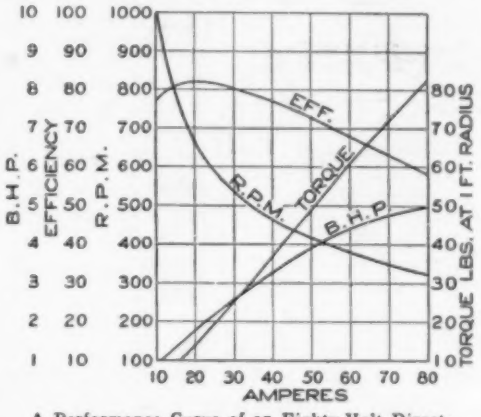
It is quite essential that persons owning, or expecting to own or have charge of, electric motors or generators should be sufficiently familiar with the performance curves of the machine in use to determine its main characteristics. These performance curves tell, graphically, the whole story of the capabilities of the machine, and it is an easy matter for one experienced in reading such curves, or familiar with them, to determine these capabilities almost at a glance.

Machines, more than ever before, are sold on their performance characteristics, as shown by curves, and the prospective customer usually demands certain characteristics of the selling company. It is no longer possible for the salesman merely to give the horsepower and voltage of a motor, and expect the purchaser to make a selection from this information alone. Characteristic curves are usually demanded. The same is true with generators.

The sketch shows the performance curves of an 80-volt direct-current series motor, such as is used on electric vehicles, and the complete behavior of the motor in operation may be determined from an inspection of these curves. In this case the various curves are all drawn with reference to the current taken by the motor, the current being plotted along the horizontal and the other quantities on the vertical lines.

The "torque" is the turning effort of the machine measured in pounds at a distance of 1 ft. from the center of the shaft. The efficiency is the output of the machine, expressed as a percentage of the input and abbreviated "eff." The "R. P. M." is the revolutions of the armature shaft per minute, and "B. H. P." is the brake horsepower.

When this motor is taking a current of 40 amperes it is operating at a speed of 460 revolutions per minute; developing a torque of 37 lb. at a radius of 1 ft.; the horsepower output is 3.25, and the efficiency is about 77 per cent. The above values of speed, torque, horsepower, and efficiency are determined by following the vertical line corresponding to 40 amperes upward until the various curves are encountered,




A Performance Curve of an Eighty-Volt Direct-Current Series Motor Used on Automobiles

and then along horizontal lines from the points of intersection to the various vertical scales where the values can be read. If any one of these quantities is given, all the others may be determined in a manner similar to that indicated above. Thus, if a machine is operating at a speed of 400 revolutions per minute, it will take a current of 53.5 amperes, the efficiency will be 71 per cent, the torque will be 53 lb. at a radius of 1 ft., and the horsepower will be a little less than 4.1.

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### The Proper Way to Place Ice in a Refrigerator

As heat always travels to the top of an inclosure, it does so also within the walls of a refrigerator; hence, if a piece of ice is not large enough to fill the ice space, lay it in such a position that the largest portion is at the bottom of the cavity. This will save considerable ice where a small quantity is used at a time.

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¶The presence of sulphur in a silver-plating solution will cause patchy deposits. The sulphur comes from the rubber used about the plating solutions.

## Proportioning Anchor Plates for Machinery Foundations

It is frequently necessary for the mechanic installing machinery to make the foundation anchor plates in the field. This is particularly true when an installation is in a small town or city where standard anchor-plate castings are not available. The following tells how satisfactory anchor plates can be proportioned and made from wrought-iron plate.

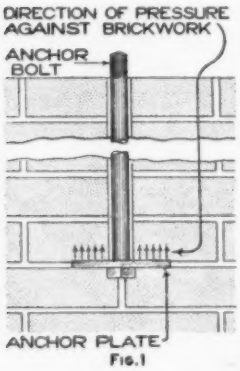

FIG. 1

The function of an anchor plate is to prevent the withdrawal of the anchor bolt from the foundation, or to anchor the holding-down bolt in the masonry. An anchor bolt and plate in position in a brick foundation is shown in Fig. 1. The strains which are imposed upon an anchor plate are indicated by the arrows. When the nut on an anchor bolt is screwed down to clamp the machine bedplate in position, the force is transmitted through the bolt to the anchor plate and then presses up against the masonry in which it is imbedded. The total force in pounds with which an anchor plate bears upwardly against the foundation masonry is equal to the tension in pounds to which the anchor bolt is subjected by screwing down the nut. In proportioning an anchor plate, it can be assumed that this load is equally distributed on the portion of the upper surface of the anchor plate outside of the bolt.

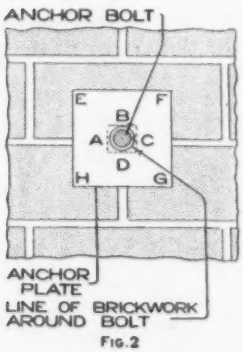

FIG. 2

In proportioning the bearing area of the anchor plate—that is, the area of the plate that pushes, or rests, against the masonry—the following rule should be observed: The area, in square inches, of the anchor plate that bears against the foundation multiplied by the safe compressive strength of the material of the foundation, in pounds per square inch, should at least equal the tension which the bolt is capable of sustaining. For example, the tensile strength of wrought iron is about 20 times the compressive strength of brick, hence the bearing area of a plate resting against a brick foundation should be at least 20 times the cross-sectional area of the bolt.

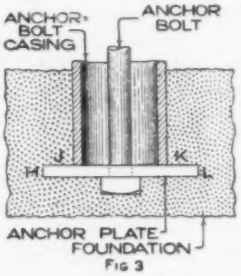

FIG. 3

Observing the foregoing rule and referring to the case of the anchor plate in question, the area EFGH, in Fig. 2, which shows a top view of the anchor plate, should be equal to at least 20 times the area of the bolt for a brick foundation.

Obviously, in figuring the effective area of the plate, the area of the circular surface ABCD must be subtracted because this area does not bear against the brick of the foundation. For materials other than brick, the ratio between the bearing area of the plate and the cross-sectional area of the anchor bolt will, of course, be different than 20 to 1. The reason for this is that other materials have different compressive strengths than brick. The compressive strengths of the various masonry materials can be found in some of the many handbooks and will not be given here.

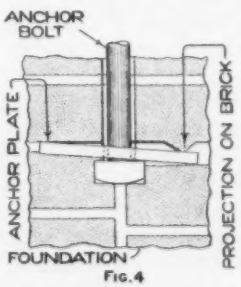

FIG. 4

From the description the procedure

in determining the area desirable for an anchor plate that is to be used in any kind of masonry will be obvious. In determining the effective bearing area of an anchor placed in a casing, as shown in Fig. 3, certain precautions must be observed. For example, only a portion of the anchor plate, indicated by HJ and KL, is effective in pushing against the masonry. The effective area of the plate is greatly reduced, due to the presence of the casing. Corrections for this condition can be readily made and the proper area of the plate computed from the suggestions which have been given.

The thickness of the anchor plate must be such that it will not bend or buckle when the bolt impresses a strain upon it. For a rough and ready rule, the thickness of a steel or iron-plate anchor may be taken as equal to .4, or possibly .5, of the diameter of the foundation bolt with which it is to be used. For example, if the foundation bolt is 1 in. in diameter the thickness of an anchor plate, in iron or steel, should be at least .4 in., or possibly .55 in. This rule is obviously a rough and ready one, and cannot be followed in all instances, although it will give safe results in the average case.

The transverse strains that are imposed on an anchor plate, due to unequal loading, may be very great. It sometimes occurs, due to the inequalities in the surfaces of bricks or stones used in a foundation, that an anchor plate will bear against the masonry at only two or three points, as shown in Fig. 4. In such a case the load is not uniformly distributed, and extensive strains are therefore imposed on the anchor plate and on the masonry. To protect against such conditions, it is well to so proportion anchor plates that their factors of safety will be ample.

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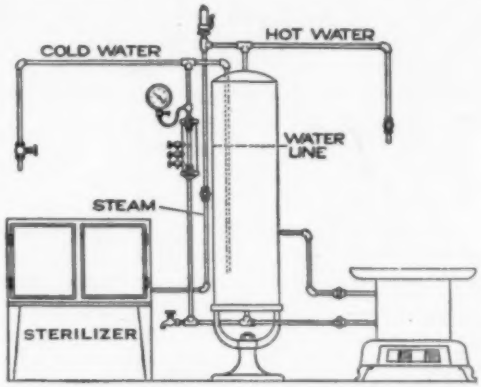
¶The presence of boracic acid in a nickelplating solution will cause the whitening of the deposit, and also makes it softer and eliminates the tendency to pit.

### Attaching Steam Sterilizer to Hot-Water Tank

If a hot-water tank be connected up as shown, it can be used not only for its regular service to furnish hot water, but, by a proper manipulation of valves,




Obtaining Steam from a Hot-Water Boiler for Use in a Sterilizer

will serve also as a boiler in furnishing steam for sterilizing purposes.

To this end, the regular connection of the stove water back to the tank should remain unchanged except for a tee in the drain pipe of the tank. This tee should have its side outlet turned vertically, so that a connection can be made with the lower end of a boiler water column, which should be placed to indicate both steam and water when about one-quarter of the tank's capacity is filled with steam. The upper end of the water column connects with the side outlet of a tee provided in the cold-water supply line. On the regular hot-water outlet at the top of the tank is connected a cross fitting. To one of its horizontal outlets is connected a short length of pipe, provided with a stop valve at the extreme end, for the purpose of relieving the vacuum when draining the tank, or permitting the escape of air when filling it with water. The opposite outlet of the cross is connected through a stop valve, conveniently placed, with the sterilizer. In order to prevent excessive pressure caused by the generation of steam, a safety valve must be provided, which

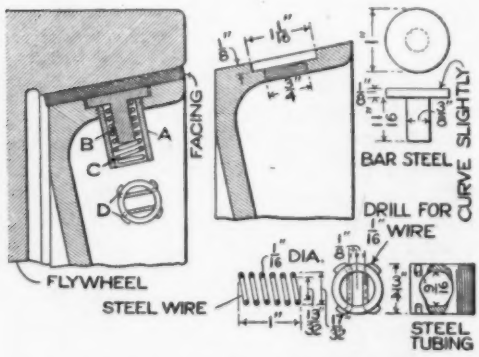
should be connected in the main outlet line so as to have no valve between it and the tank, thereby preventing any possibility of an explosion by carelessly shutting off the operation of the safety valve. The steam pressure should at all times be indicated, and for this purpose a steam gauge should be attached to the water column through a circular or U-loop, which is for the purpose of retaining water at all times so the steam cannot come in direct contact with the gauge and injure it.

When using the heater for regular service, the sterilizer stop valve should first be shut off. Then the cold-water valve can be opened to fill the tank, the air of the tank meanwhile being relieved by the valve at the end of the short pipe.

In using the sterilizer in connection with the tank, the cold-water supply should first be shut off. Then the water in the tank may be drained off until the water level shows about halfway in the water column, the vacuum in the tank meanwhile being relieved by the valve at the end of the short pipe line. When the proper level has been obtained, the vacuum-relieving valve should be shut off and steam may be raised as required. Should the amount of steam become excessive, part of the tank water may be drained off, and an equal amount of cold water added; this will tend to condense the steam and relieve the pressure. The water level should be regulated so it can always be seen in the gauge glass; if it is too high, part of it should be drained off; if too low, an extra amount must be added from the cold-water supply.—Contributed by W. N. House, Great Neck, N. Y.

## To Make a Cone Clutch Engage Smoothly

A cone clutch that cannot be made to engage smoothly, can be remedied to some extent as follows: Make six or




Pressure Buttons to Raise the Surface of a Clutch, to Make It Take Hold Slowly

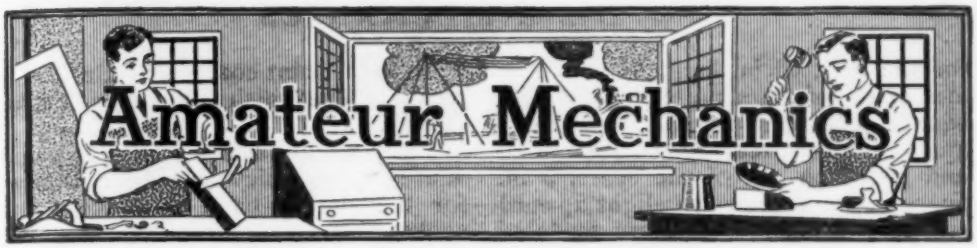
more sets of pressure springs and place them in the clutch face, as shown. Each set consists of a collar, A, which is screwed into the face of the clutch; a plunger, B, operating in the collar and against the action of a coil spring, C, which is held in position by means of two pins, D. The shape and dimensions of these various parts are shown in the sketch.

The portion of the clutch facing, directly above the plunger B, is raised a trifle higher than its normal height, due to the pressure of the spring, with the result that the entire surface of the facing does not come in contact when the clutch is engaged, and the sudden gripping is entirely eliminated.

## Etching Fluid

An excellent fluid for etching steel, either for making a beautiful frosted effect, or for deep etching of names and trade-marks, is made up as follows: Mix together ¼ oz. of powdered table salt and 2 oz. of copper sulphate with ½ pt. of vinegar and 40 drops of nitric acid. The parts not to be etched are covered with paraffin or beeswax. Deep etching or frosting is effected by leaving the article to the action of the fluid for a longer or shorter time.

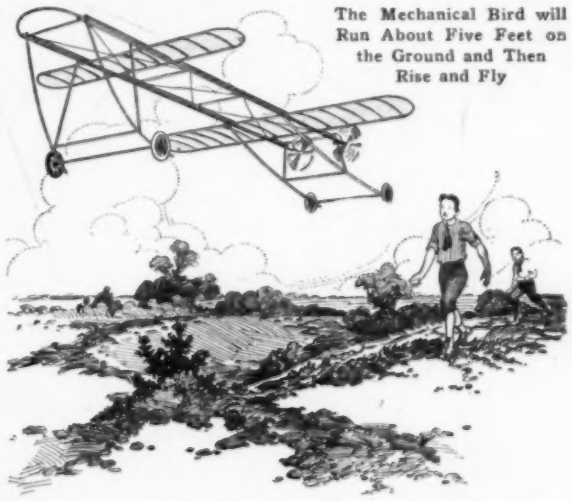
¶It is dangerous to put a large washer on one side and a small one on the other of an emery wheel.




# How to Make a Model Old-Four Monoplane

By RALPH M. BROWN

THE old-four monoplane model, made famous by its wonderful flights, is one of the most graceful that has been built. Its large size and slow, even glide make it a much more desirable flier than the ordinary dartlike model. It gives one a true insight into the phenomena of heavier-than-air flight. This machine, when complete, should weigh 9 oz. and fly 1,200 ft., rising from the ground under its own power and landing lightly. Its construction is simple, and with careful reference to the sketches, an exact reproduction may be made.



The Mechanical Bird will Run About Five Feet on the Ground and Then Rise and Fly

For the motor bases, A, Fig. 1, secure two spruce sticks, each 48 in. long, 3/8 in. wide, and 1/4 in. thick, and fasten a wire hook on one end of each stick with thread wound around after giving it a coat of glue. These hooks are to hold one end of the rubber bands that act as the motive power, and are designated by the letter B. At the opposite ends of the sticks, at C, bearings are provided, which consist of blocks of wood, each 1 in. long, 1 in. wide, and 3/8 in. thick. These are also bound in place with thread after gluing them. Holes are drilled through the blocks lengthwise and then lined with bushings made of brass tubing, 1/16 in. in inside diameter. The two motor bases A are connected with four cross sticks, D, each 9 in. long and 3/16 in. square. These are bound and glued on the under side, one near each end and the others equidistant each from the other and from the nearest end stick. The front bumper E is made of round rattan, 1/8 in. in diameter.

The alighting gear is next in order of construction. This is made as shown entirely of bamboo, 3/16 in. square. The pieces marked F are 11 in. long; G, 9 1/2 in. long, and the cross bar H, 11 in. long. At the rear, the pieces J are 13 in. long; K, 4 1/2 in. long, and the cross piece L, 11 in. long. The distance between the points M and N, Fig. 2, is 6 in., and between O and P, 9 in. The bamboo is easily curved by wetting and holding it for an instant in the flame of a candle. It will hold its shape just as soon as it becomes cold. The wheels are made of tin, 1 1/2 in. in diameter, borrowed from a toy automobile. The axles are made from wire, 1/16 in. in diameter.

The wing spars Q are made of spruce, 3/16 in. wide and 1/4 in. thick. Those for the front are 30 in. long, and

for the rear, 36 in. long. The ribs R are made of bamboo pieces, 1/16 in. square, 5 in. long for the front plane, and 6 in. for the rear. These are bound and glued on top of the spars, 3 in. apart. They are given a slight upward curve. The round ends are made of 1/16-in. rattan.

It is rather difficult to make good propellers, but with a little time and patience they can be shaped and formed into good proportions. Procure two clear, straight-grained blocks of white pine, 8 in. long, 1½ in. wide, and ¾ in. thick. Draw a diagonal line on one block from opposite corners, as shown at S, Fig. 3, then on the other block T, draw the line in an opposite direction. Turn the blocks over and draw opposite diagonals, as shown by the dotted lines. Draw a circle on each side exactly in the center, ½ in. in diameter. Drill 1/16-in. holes through the centers of the circles for the propeller shafts. The wood is then cut down to the lines drawn, leaving only enough material so that they will not break easily. The face of the blades should be flat and the back rounded. Leave plenty of stock near the hub. After the faces have been finished, the blades are shaped as shown at U. The propellers should be finished with sandpaper to make them perfectly smooth, as much of the success of the model will depend upon them. It will be a good plan to shellac them, and also the frame and the alighting gear. Aluminum paint costs but little, and it makes a fine finish for a model aeroplane.

The propeller shafts V, Fig. 1, 2, and 4, are cut from bicycle spokes. An eye for the rubber band is bent in the spoke, about 2 in. from the threaded end. The end having the threads is run through the bearing block C, Fig. 4, and the propeller fastened on with a small washer on each side of it by means of two nuts, W, cut from a bicycle nipple. These nuts may be turned up tightly with pliers.

The planes are covered with tissue paper put on tightly over the tops of the ribs, using a flour paste. The planes are movably fixed on the motor bases A by tying at the four points of contact with rubber bands. This makes it possible to adjust the fore-and-aft balance of the machine by changing the position of the planes.

The motive power, which is the most important part of the entire machine, consists of rubber bands. There are three ways of obtaining these bands. It is best, if possible, to purchase them from an aeroplane supply house. In this case, procure about 100 ft. of 1/16-in. square rubber, 50 ft. for each side. These are wound closely between the hooks X. This rubber can be taken from a golf ball. It will require about 40 strands of this rubber, which is removed by cutting into the ball, on each propeller. Another way of obtaining the bands is to purchase No. 19 rubber

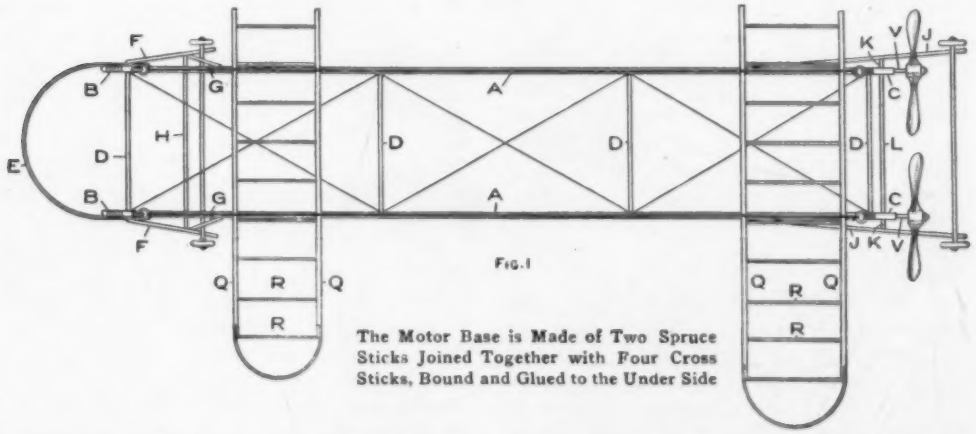



FIG. 1

**The Motor Base is Made of Two Spruce Sticks Joined Together with Four Cross Sticks, Bound and Glued to the Under Side**

bands and loop them together, chain-fashion, to make them long enough to reach between the hooks without stretching. About 30 strands on each machine and hooked into the eye in the drill. Stretch the rubber out for about 10 ft., and as it is wound up, let it draw back gradually. Wind up the propel-

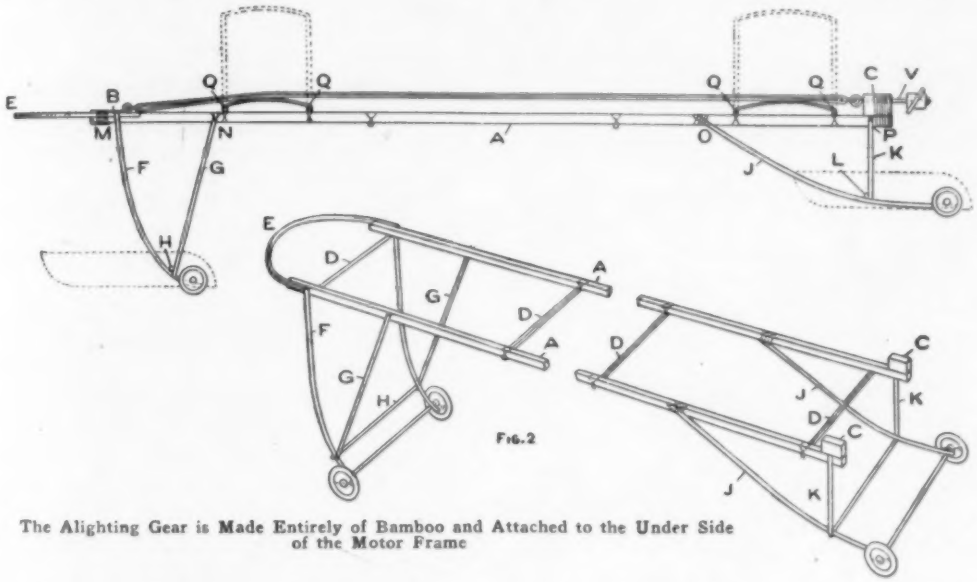



FIG. 2

The Alighting Gear is Made Entirely of Bamboo and Attached to the Under Side of the Motor Frame

propeller will be sufficient. The hooks X are made in the shape of the letter "S," to provide a way for taking out the rubber bands quickly. To prevent the hooks from cutting the rubber, slip some 1/16-in. rubber tubing over them. The rubber bands, or motor, when not in use, should be kept in a cool, dark place and powdered with French chalk to prevent the parts from sticking together.

With the model complete, flying is the next thing in order. With a machine as large as this one, quite a field will be necessary to give it a good flight. Test the plane by gliding it, that is, holding it up by the propellers and bearing blocks on a level with your head and throwing it forward on an even keel. Shift the planes forward or back until it balances and comes to the ground lightly.

Winding up the propellers is accomplished by means of an eye inserted in the chuck of an ordinary hand drill. While an assistant grasps the propellers and motor bearings the rubber is unhooked from the front of the lers in opposite directions, turning them from 400 to 800 revolutions. Be sure to wind both propellers the same number of turns, as this will assure a straight flight.

Set the machine on the ground and release both propellers at once, and at the same time push it forward. If

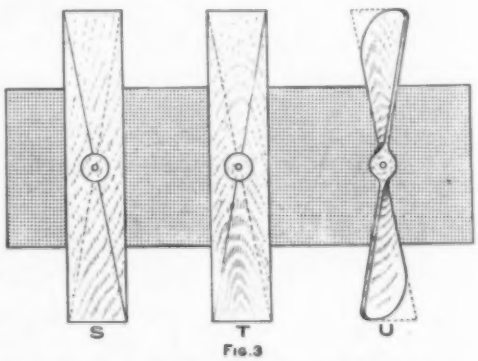



FIG. 3

The Most Difficult Part of Making the Propellers can be Overcome with a Little Patience

everything is properly constructed and well balanced, the mechanical bird will run about 5 ft. on the ground and then

rise to 15 or 20 ft. and fly from 800 to 1,200 ft., descending in a long glide and alighting gracefully.

If the machine fails to rise, move the

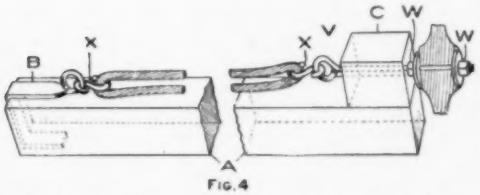



FIG. 4

The Motive Power, Which Is the Most Important Part of the Machine, Consists of Rubber Bands

forward plane toward the front. If it climbs up suddenly and hangs in the air and falls back on its tail, move it toward the back.

After the novelty of overland flights has worn off, try flights over the water. To do this the wheels must be removed and four pontoons put in their place, as shown by the dotted lines in Fig. 2. The pontoons are made over a light frame, constructed as shown in Fig. 5. The frame pieces are bamboo, 1/8 in. square. Each one is 8 in. long, 4 in. wide, and 2 in. deep. The covering consists of writing paper glued in place, after which the whole surface is covered with melted paraffin to make it water-tight.

No doubt various methods will be suggested by the time such flights are made, such as smaller planes for racing, larger ones for altitude and duration, etc. To make the machine carry weights, build a duplicate set of planes

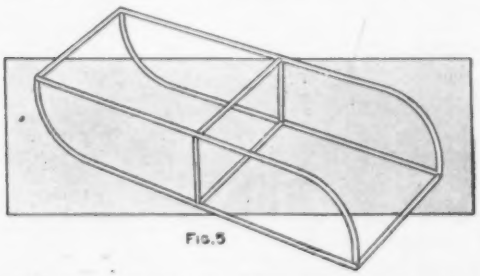


FIG. 5

Framework for Constructing Pontoons by Covering Them with Writing Paper Soaked in Paraffin

and fasten them 6 in. above the others by means of struts, 3/16 in. square, forming a tandem biplane, as shown by the dotted lines in Fig. 2.

Patience is the one thing necessary in model building. Sometimes a machine carefully made will not fly, and no one can make it do so until some seemingly unimportant alteration is made.

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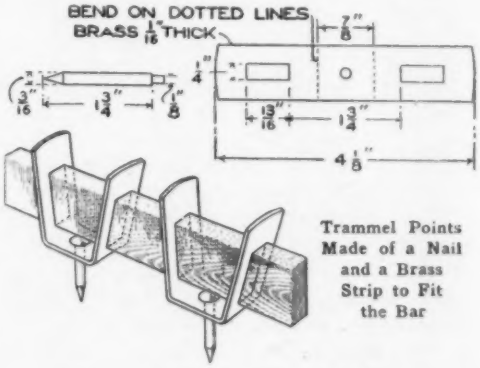
### How to Make a Pair of Trammels

The making of these trammels is a very nice workshop problem for a school, as it requires a very small amount of stock and a corresponding degree of skill, and at the same time adds a little something to the general shop equipment.

The brass is best procured in strips, which may be had in different widths, except the bar, which is 1/4 in. thick and not less than 3/4 in. wide. The steel for the points may be the ordinary steel,




Trammel Points Made of a Nail and a Brass Strip to Fit the Bar

or if the trammels are to be used on woodwork, very satisfactory points can be made of heavy nails.

Cut two pieces of brass, 4 1/4 in. long, and straighten them with a wood or rawhide mallet on a surface plate. Draw center lines both ways through each piece and lay out the openings for the bar with a sharp scriber, and make a center-punch mark for the 1/8-in. hole that is to be drilled at the intersection of the center lines. Mark the lines where the piece is to be bent, and with a pair of dividers lay out the ends and shape them with a file.

The center hole and bar openings are next drilled, and the latter finished by filing. It is better to plane up a short piece of hard wood, 1/4 by 13/16 in., and

use it as a gauge in filing the rectangular openings than to try to make them by measurement. Polish the brass pieces with a piece of fine emery cloth or paper, rubbing it in straight lines lengthwise of the stock.

The bending is done by clamping the pieces in a vise and bending first one side and then the other on the lines indicated. This will require some care, as the upper ends should be 1¼ in. apart on the inside when the bending is complete. To insure the same angle on both sides, a template of wood is used, and the pieces are carefully bent to fit it.

The holes for the points are reamed tapering from the inside, where they are riveted in place. The points are filed to shape and polished, which is best accomplished in a lathe. Clamp one of the points in an upright position in a vise with the shouldered end up. Slip one of the brass pieces in place and rivet by upsetting the projecting end with a light hammer.—Contributed by J. A. Shelly, Brooklyn, N. Y.

### Seeding Bare Spots on Lawns

A lawn that shows patches of grass with bare spots, or only partly covered with grass can be sown with seed that will fill the uncovered places by using the tool illustrated. It is made of a block of wood, 1 in. thick, into which several large nails are driven so that their ends project about 1½ in. Another block is fastened on top of the nail heads to keep them from pushing out of their holes. A handle is attached to the latter block.

The tool is used by driving it into the earth where there is no grass, or in thin places, and the grass seed is sprinkled into the holes. In raking over the lawn the young grass is not so apt to be torn out and destroyed before it gets a good root.—Contributed by Edmund H. Trabold, Orange, N. J.

### A Porch Swing

The seat of the swing consists of a board, 30 in. long, 14 in. wide, and 1 in. thick, with holes bored in each corner for the ropes. The rail at the top is made of four oak pieces, two of them 30 in. long, for the sides, and the other two 18 in. long, for the ends; all 3 in. wide and ⅞ in. thick. The ends of these pieces are finished rounding, and holes are bored in them for the supporting ropes. The supports for the rails consist of four pieces of ¾-in. pipe, 15 in. long. The ropes are run through the holes in the ends of the rails, down through the pipes and through the holes in the seat board, where they are knotted.

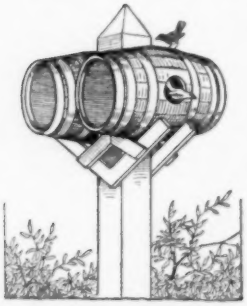
A Porch Swing Having a Rail That Incloses the Person Sitting in It

A rope tied to a convenient post or screw hook makes a handy way to give motion by pulling. To get into the swing, raise one of the side rails on the rope.—Contributed by Ward M. Mills, Bakersfield, Cal.

¶Cover the top and side of ice in a refrigerator with a piece of Canton flannel, and the ice will last longer.

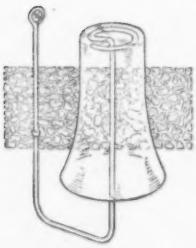
### Bird House Made of Kegs

Two ordinary nail kegs, or other small kegs, will make a good bird house. They should be mounted on a square post with braces of light wood, as shown. The openings for the entrance can be cut in the ends or sides, as desired. If cut in the sides, be sure to make the hole between two staves.



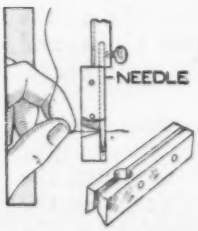
### A Drinking-Glass Holder

To make a glass holder quickly, shape a wire as shown in the sketch. The wire should be of sufficient size to hold the glass firmly. It is fastened to the wall, or support, with a screw and a staple. — Contributed by Edwin P. Stott, Chicago, Ill.



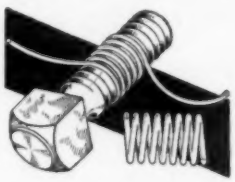
### Needle Threader for a Sewing Machine

The threader consists of two brass pieces riveted together so that they will make an extension conical hole for the thread to enter freely. The length of the pieces should be such that when the upper end of the threader is placed against the needle-holder end, the conical hole will coincide with the hole in the needle. A piece of thin sheet metal is placed between the pieces above the conical hole to make an opening below for the thread to pass through when the threader is removed. The opposite edges of the brass pieces from the large part of the conical hole are filed to a bevel so that when they are riveted together they will form a V-shaped groove to center the needle.—Contributed by Harriet M. Kerbaugh, Allentown, Pa.



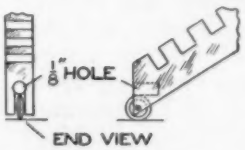

### Winding Coiled Springs

When a helical spring is needed badly, one can be made up quickly by winding the wire around in the threads of an ordinary bolt. An accurate spring can be formed, and the pitch between each coil will be exact for the entire length. In removing the spring from the bolt, grasp the coil in one hand and turn the bolt with the other.



### Revolving-Wheel Ruling Pen

A ruling pen that will do neat work and not leave any ink on the ruler, and which with its small ink fount draws many lines at one filling, can be made from an old discarded revolving-wheel glass cutter. A 1/8-in. hole is drilled in the body, or handle part, just above the wheel. The hole is filled with a piece of felt—a piece cut from an old felt hat will do—rolled to fit snugly, so that it will bear lightly against the wheel. The felt is soaked with the ink to be used, and the pen is ready for use.—Contributed by Bert Fish, Rochester, N. Y.




¶An excellent method of closing a crack in a wall before papering is to paste a thin strip of linen over the crack. This not only makes a smooth job, but prevents the paper from tearing, should the crack widen.

# The Tricks of Camping Out

By STILLMAN TAYLOR

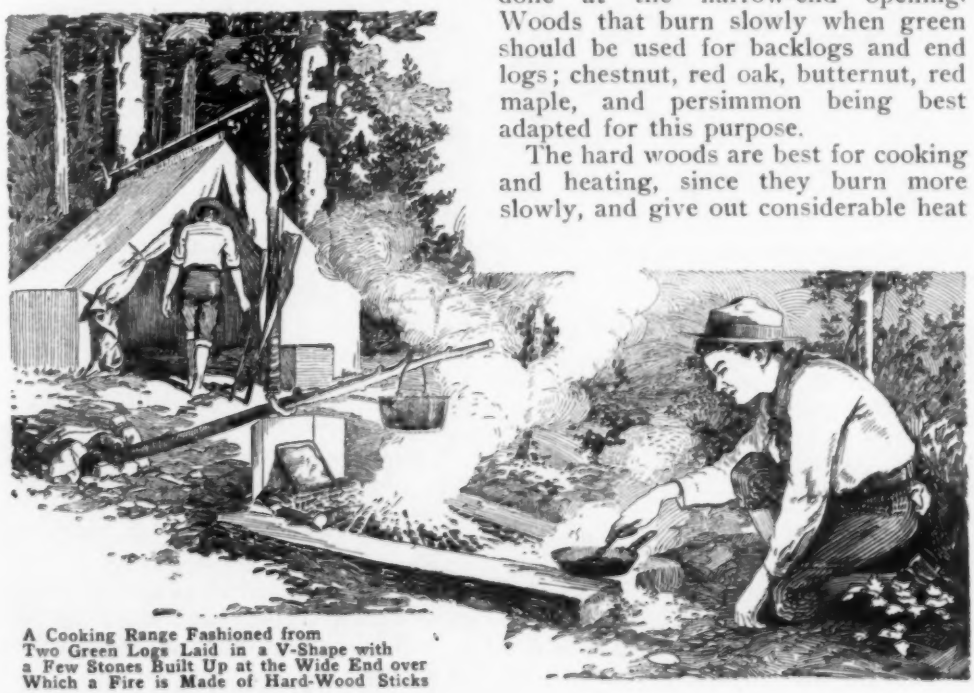
## PART II—Cooking in the Woods

COOKING in the woods requires more of a knack than equipment, and while a camp stove is well enough in a permanent camp, its weight and bulk makes this article of camp furniture unsuited for transportation by canoe. Patent cooking grates are less bulky, but the woodsman can learn to do without them very nicely. However, the important item which few woodsmen care to do without is the folding baker, or reflector. The baker is folded flat and carried in a canvas case, including baking pan and a kneading board. The largest size, with an 18-in. square pan, weighs about 5 lb., and the smallest, with an 8 by 12-in. pan in aluminum, only 2 lb. In use, the reflector is placed with the open side close to the fire, and cooking is accomplished evenly and well in any kind of weather. Bread, fish, game, or meat are easily and perfectly cooked, and the smaller size is amply large for a party of two or three.

The camp fire is one of the charms of the open, and if it is built right and of the best kind of wood, cooking may be done over it as well as over a forest range. Many woodsmen prefer to build a second and smaller fire for cooking, and although I have never found this necessary, excepting in large camps where a considerable quantity of food must be prepared, the camper can suit himself, for experimenting is, after all, a large part of the fun of living in and off the woods.

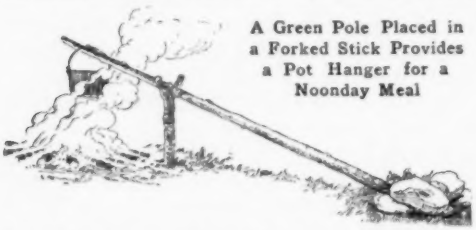
A satisfactory outdoor cooking range may be fashioned by roughly smoothing the top and bottom sides of two green logs, and placing them about 6 in. apart at one end and about 2 ft. apart at the opposite end. At the wide end a few stones are built up, and across these, hickory, ash, and other sticks of hard wood are placed. The reflector is placed close to the coals at this end, and the fire is built between the logs, the broiling and frying being done at the narrow-end opening. Woods that burn slowly when green should be used for backlogs and end logs; chestnut, red oak, butternut, red maple, and persimmon being best adapted for this purpose.

The hard woods are best for cooking and heating, since they burn more slowly, and give out considerable heat



A Cooking Range Fashioned from Two Green Logs Laid in a V-Shape with a Few Stones Built Up at the Wide End over Which a Fire is Made of Hard-Wood Sticks

and burn down to a body of glowing coals. Soft woods are quick to catch fire, burn rapidly, and make a hot fire, but burn down to dead ashes. Hickory is by far the best firewood of the North, in that it makes a hot fire, is long-burning, and forms a large body of coals that gives an even and intense



A Green Pole Placed in a Forked Stick Provides a Pot Hanger for a Noonday Meal

heat for a considerable length of time. Next to hickory comes chestnut; the basket oaks, ironwood, dogwood, and ash are the woodsman's favorites. Among the woods that are easy to split are the red oak, basket oak, white oak, ash, and white birch. Some few woods split more easily when green than after seasoning, and among them are hickory, dogwood, beech, sugar maple, birch, and elm. The most stubborn woods to split are the elder, blue ash, cherry, sour gum, hemlock, sweet gum, and sycamore. Of the softer woods, the birches make the best fuel; black birch in particular makes a fine camp fire, and it is one of the few woods that burns well when green. The dry bark of the hemlock makes a quick and hot fire, and white birch takes fire quickly even though moist. Driftwood is good to start a fire with, and dry pine knots —the limb stubs of a dead pine tree— are famous kindlers. Green wood will, of course, burn better in winter when the sap is dormant, and trees found on high ground make better fuel than those growing in moist bottom lands. Hard woods are more plentiful on high ground, while the softer woods are found in abundance along the margins of streams.

For cooking the noonday meal a small fire will suffice to boil the pot and furnish the heat sufficient to make a fry. Simply drive a forked stick in the ground and lay a green stick in the fork with the opposite end on the ground with a rock laid on it to keep it down, and hang the pot on the projecting stub left for this purpose. A long stick with projecting stubs, planted in the ground to slant over the fire at an angle, will serve as well. Let the pot hang about 2 ft. from the ground, collect an armful of dry twigs and plenty of larger kindling sticks. Now shave three or four of the larger sticks and leave the shavings on the ends, stand them up beneath the pot, tripod fashion, and place the smaller sticks around them to build a miniature wigwam. While the pot is boiling get a couple of bed chunks, or andirons, 4 or 5 in. in diameter, set and level these on each side of the fire, and put the frying pan on them. When the pot has boiled there will be a nice bed of coals for frying that will not smoke the meal.

When the woodsman makes "one-night stands," he will invariably build the fire and start the kettle boiling while he or a companion stakes the tent, and as soon as the meal is prepared, a pot of water is started boiling for dish washing.

For roasting and baking with the reflector, a rather high fire is needed and a few sticks, a yard or more long, resting upright against a backlog or rock, will throw the heat forward. When glowing coals are wanted one can take them from the camp fire, or split uniform billets of green, or dead, wood about 2 in. thick and pile them in the form of a hollow square, or crib. The fire is built in the center of the crib and more parallel sticks are laid on top until it is a foot or more higher. The crib will act as a chimney, and a roaring fire will result, which upon burning down will give a glowing mass of coals.

Camp cookery implies the preparation of the more simple and nutritious foods, and in making up a list it is well to include only the more staple foodstuffs, which are known to have these qualities. Personal ideas are certain to differ greatly, but the following list may be depended upon and will serve as a guide.

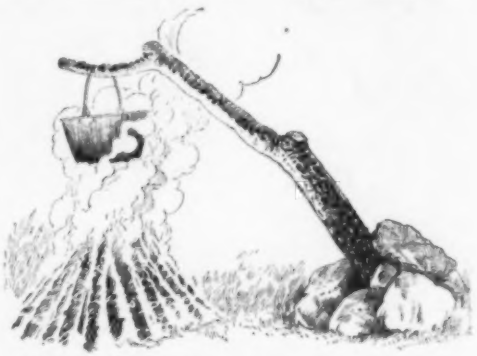
### Provision List

This list of material will be sufficient for two persons on an outing of two weeks. Carry in a stout canvas food bag 12 lb. of common wheat flour. The self-raising kind is good, but the common flour is better. It is well to bring a little yellow, or white, corn meal, about 6 lb., to be served as a johnny cake, hot, cold, or fried mush. It is fine for rolling a fish in for frying. Rice is very nutritious, easily digested, and easy to cook. It is good when boiled with raisins. When cold, it can be fried in slices. About 3 lb. will be sufficient. Oatmeal is less sustaining than rice, but it is good for porridge, or sliced when cold and fried. Take along about 3 lb. About 2 lb. of the self-raising buckwheat flour should be taken along, as it is the favorite for flapjacks or griddle cakes. Beans are very nutritious, and about 2 lb. of the common baking kind will be required, to boil or bake with the salt pork. For soups, take 2 lb. of split peas. They can also be served as a vegetable. Salt pork is a stand-by, and 5 lb. of it is provided and carried in friction-top tins or a grease-proof bag. It should be parboiled before adding to the beans or when fried like bacon. The regulation meat of the wilderness is bacon, and 5 lb. of it is carried in a tin or bag. Carry along 3 lb. of lard in a tin or bag, for bread-making and frying. About 3 lb. of butter is carried in a friction-top tin. For making rice puddings, take along 1 lb. of raisins. About 1 lb. of shredded codfish is good for making fish balls. Other small articles, such as ½ lb. of tea; 1 lb. of coffee; 3 lb. of granulated sugar; 1 pt. of molasses; 1 pt. of vinegar; 4 cans of condensed milk; 1 can of milk powder, a good substitute for fresh milk; 1 can egg powder, good for making omelets or can be scrambled; 1 lb. salt; 2 oz. pepper; 1 package each of evaporated potatoes, onions, and fruits, and 3 packages of assorted soup tablets.

This list is by no means complete, but it will suffice for the average person on the average trip, since the occasional addition of a fish or game will help to replenish the stores. When going very light by pack, only the most compact and nutritious foods should be selected, while on short, easy trips the addition of canned goods will supply a greater variety.

### Woodcraft

While shooting and fishing and camping out are chapters in the book of woodcraft, the word is generally de-



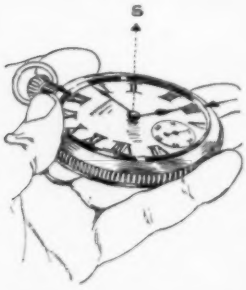
A Limb Supported at an Angle over the Fire Is Another Means of Hanging the Pot

fined to mean the knack of using the compass, the map, and in making use of the natural signs of the woods when traveling in the wilderness. If the camper keeps to the beaten paths and does not stray far from the frequently used waterways, he needs no compass, and sufficient knowledge of the ways of the woods may be acquired from the previous articles, but if the outer ventures into an unknown region the value of more intimate knowledge increases as the distance to civilization lengthens, because it will enable him to keep traveling in the desired direction and prevent the "insane desire to circle," should one discover he has lost the trail.

### The Emergency "Snack" and Kit

The woodsman well knows that it is an easy matter to stray farther from camp than he intended to when starting out, and that it is a common enough occurrence to lose one's bearings and become temporarily lost. To prepare for this possible emergency and spend a comfortable night away from the

camp, he carries in his pocket a little packet of useful articles and stows away a tiny package containing a small amount of nutritious food. When leaving camp for a day's hunting and fishing, the usual lunch is, of course, included, but in addition to this, the woodsman should carry a couple of soup tablets, a piece of summer sausage, and some tea. Wrap this in oiled silk, and pack it in a flat tin box. It will take up very little room in the pocket.




The emergency kit is merely a small leather pouch containing a short fishing line; a few fishing hooks; 1 ft. of surgeon's adhesive plaster; needle and thread; a few safety pins, and a small coil of copper or brass wire. These articles, with the gun and a few spare cartridges, or rod; a belt knife; match safe; compass; map; a little money, pipe, and tobacco, make up the personal outfit without which few woodsmen care to venture far from camp. In addition to the above, I carry a double-edge, light-weight ax, or tomahawk, in a leather sheath at the belt and a tin cup strung to the back of the belt, where it is out of the way and unnoticed until wanted.

### The Compass

A small pocket compass affixed to a leather thong should be carried in the breast pocket and fastened to a button of the shirt. An instrument costing $1 will be accurate enough for all purposes. Many of the woodsmen as well as the Indians do not use a compass, but even the expert woodsman gets lost sometimes, and it may happen that the sun is obscured by clouds, thus making it more difficult to read the natural signs of the wilderness. The compass is of little value if a person does not know how to use it. It will not tell in what direction to go, but when the needle is allowed to swing freely on its pivot the blue end always points to the magnetic north. The true north lies a degree or more to either side. In the West, for instance, the needle will be attracted a trifle to the east, while on the Atlantic coast it will swing a trifle to the west of the true north. This magnetic variation need not be taken into account by the woodsman, who may consider it to point to the true north, for absolute accuracy is not required for this purpose. However, I would advise the sportsman to take the precaution of scratching on the back of the case these letters, B = N, meaning blue equals north. If this is done, the novice will be certain to remember and read the compass right no matter how confused he may become on finding that he has lost his way. The watch may be used as a compass on a clear day by pointing the hour hand to the sun, when the point halfway between the hour hand and 12 will be due south.

The compass needle is attracted to iron and steel, therefore keep it away from the gun, hatchet, knife, and other metal articles. Hold the compass level and press the stop, if it has one, so that the needle may swing free. Note some landmark, as a prominent tree, high cliff, or other conspicuous object lying in the direction of travel, and go directly to this object. Consult the compass frequently when making a detour, or when the landmark passes out of sight. When this mark is reached, select another farther on and continue the travel, always picking out new marks along the line indicated by the compass. When making camp, consult a map, study it, and so gain a good general idea of the surrounding country; and when leaving

camp, take the bearings from the compass. By so doing a person will know in what direction he is traveling, and when the course is changed, keep the general direction in mind. When climbing a hill or making detours, take a mental note of the change in direction and the bearings will not be lost.

### Maps

The maps of the U. S. Geological Survey are drawn to a scale of 2 in. to the mile and cost 5 cents each. On the back of each map are printed the

symbols showing the character of the land, the contours, roads, and all important rivers and lakes in the district. For convenience, the map should be pasted on a backing of cotton cloth and then cut up into handy sections. Number the sections from left to right and paste a key to the pieces on the back of one of them.

### Natural Signs

When traveling through underbrush the woodsman cannot see far ahead, and so lays a true course by noting the position of the sun. For example, here in the northern hemisphere the sun rises just south of east and sets somewhere south of due west. Therefore, if a person is going north, he should keep the sun on the back and to the right shoulder in the morning hours; full on the back at noon, and on the

Note Some Landmark, as a Prominent Tree, High Cliff, or Other Conspicuous Object Lying in the Direction of Travel and Go Directly to the Object, and Look for the Old Blaze Marks

back and over the left shoulder throughout the afternoon.

If the day is cloudy, set the point of a knife blade on the thumb nail, twist it around until the full shadow is cast on the nail, thus indicating the position of the sun.

The direction of the wind is apt to change and for this reason is an unreliable guide, while the so-called signs of the woods, such as the tips of evergreen trees pointing north, bark being thicker on the north side of trees, or moss growing thicker on the north side of the trees, are by no means to be depended upon. There is absolutely nothing in these signs. However, every woodsman is aware that the foliage of trees grows somewhat thicker on the south side, and that the branches are rather shorter and more knotty on the north side, but these and other signs are scarcely infallible, and if they were, few tenderfeet would recognize them.

When traveling by night, look for the Big Dipper or Great Bear, as the two end stars are known as the pointers, pointing to the north star.

### Marking the Trail

When traveling over old and blind trails, look for the old blaze marks, and if doubtful about them, make new ones by breaking down the brushes every 15 or 20 ft., the bent part pointing in the direction of travel. If a road is encountered, it is easy to tell if it is a tote or logging road, for tote roads are crooked and wind about the trees and rocks, while the logging road is fairly straight and broad. Of course, tote roads lead nowhere in particular, but all logging roads are sure to come to a fork and lead to water. When breaking a new trail, blaze it by taking a single clip from a tree from the side it is approached, and on the opposite side make two blazes, indicating the way from the camp. If this is done, a person will always know the way back if the trail is crossed from side to side. This is the rule of the wilderness, but is not always observed to the letter, for many woodsmen blaze their trail by clipping the trees as they pass them. Be sure to blaze your own trail correctly, and when you come to a place where two roads or trails fork, set a stick to indicate the right direction.

When a person becomes lost in the woods, as every woodsman is sure to do sometimes, sit down and think it over. Many times a person is nearer camp and companions than it is possible to realize, and if a straight direction is taken, a lumber road or a stream will be found that will give one his bearings. Above all, do not become frightened. If the emergency kit and lunch have not been forgotten, a day and night in the woods alone is not a hardship by any means. Avoid wasting energy by rushing madly about and forgetting to blaze the trail that is being made. Bend the points of the brushes down in the direction of travel. Do not shoot the last cartridge to attract attention, and do not shout until hoarse. Sit down and build a fire of green wood, damp leaves or moss, so that it will smoke. Build a second fire a short distance from the first. This is the recognized signal of the one who is lost. The afternoon may be windy, but the wind is certain to die away at sundown, and the smoke rising from the fires will be visible from a considerable distance. When an Indian gets lost he merely camps on the spot and awaits the next day for picking up the trail.

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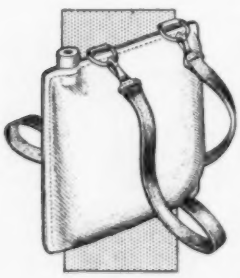
### A Camp Water Bag

While out on a camping trip I devised a way to supply the camp with cool water. A strip of heavy canvas was cut about 2 ft. long and 1 ft. wide, and the edges were sewed up to make a sack 1 ft. square. In one upper corner a large porcelain knob insulator was sewed in for a mouth piece; the groove around it made a water-tight joint with the cloth. Two metal rings were sewed in the cloth at the top for attaching a strap to carry it. The side and top seams were made as tight as possible.



In use this sack was filled with as cool water as possible and tightly corked. It was then hung in the shade where a breeze would strike it. The water gradually seeped through the cloth and this, in evaporating, kept the contents cool. This sack also came in handy while fishing or on the road.—Contributed by Earl Zander, Three Rivers, Mich.

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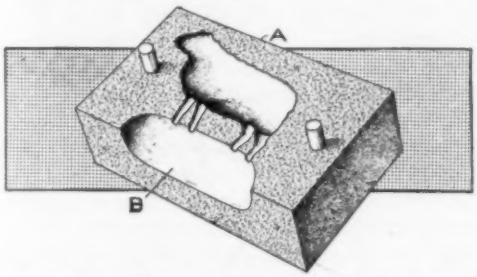
### A Mold for Making Hollow Candy Figures

Those semitransparent candies made up in the shapes of animals which are brought out for the holidays and are so dear to the children have caused many to desire to know how they are made hollow. It is a little trick of the candy-maker, which is perfectly clear to mechanics. The candies are cast in metal

molds just as babbitt bearings are cast for motor cars. One-half of such a mold is shown in the sketch. A concave recess in the face gives the shape of a horse, dog, or sheep, and another half with a similar recess is laid on and located with two dowels. In use the halves are set on a table resting on the back face A, the hot liquid is poured in at B until the mold is full, then it is allowed to set for a minute, during which the portion in contact with the cold metal hardens, whereupon the mold is turned over and the still liquid center is poured out. This leaves a

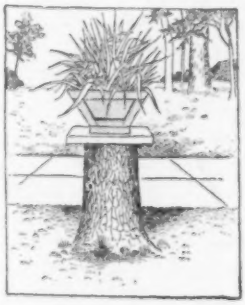



One-Half of a Mold Cut in Metal and Used in Pairs to Make Hollow Candy Objects

glossy surface like candy, a delight to the child, that saves money for the maker and because of its thin walls makes eating easy.

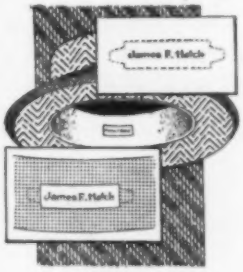
### Ornamenting an Old Tree Stump

An old stump remaining after cutting down a large tree in front of a house was made into an ornamental object in the following manner: A cap was made of concrete, reinforced with a square piece of netting. A concrete vase was made and set on the cap. It is only necessary to make a square box from a few scrap boards of the desired size, built up around the stump top. A neat mixture of cement is made and poured in around it, and allowed to set.



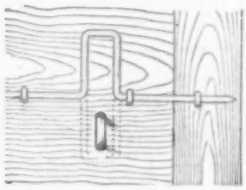
### Marker for a Hat

A quick and convenient way of marking a hat is to take a visiting card and cut it down in the manner shown in the illustration, then make two small slits in the sweatband of the hat and insert the ends of the card. If the card becomes soiled it can be easily replaced with another. The address can be added if desired.—Contributed by James F. Hatch, Raleigh, N. C.




### A Quickly Made Door Latch

A door latch that is efficient as well as simple may be made by bending a piece of iron rod and pointing one end, as shown in the illustration, then securing it to the door with staples; or small rods may be bent in the shape of a staple and the ends threaded for nuts. The door is locked by turning the handle in the position shown by the dotted lines and securing it with a padlock.—Contributed by Claud M. Sessions, Waynesville, Ill.



### An Electric Lure for Fish

Every good fisherman knows that a light will attract fish. A simple light can be made by taking a pint fruit jar, cutting a ¼-in. hole in the top of the cover, inserting a piece of gas pipe in the hole and soldering it to the cover. Insulated wires are run through the pipe, and a small electric globe is attached to the ends in the jar. The other ends of the wires are attached to a pocket battery. The jar is placed under water and the light turned on, which attracts the fish.

# How to Make Hammocks

By CHARLES M. MILLER

## PART II—A Netted Hammock

A GOOD hammock should be about 12 ft. long, which includes 8 ft. of network and 2 ft., at each end, of long cords that are attached to rings. Seine

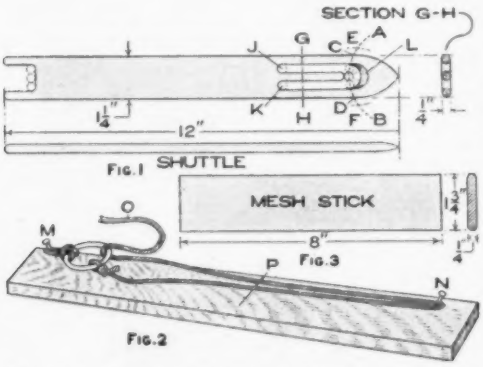



FIG. 1 SHUTTLE

FIG. 3

FIG. 2

**The Tools Necessary Consist of a Needle, or Shuttle, a Gauge Board, and a Mesh Stick**

twine, of 24-ply, is the best material and it will take 1½ lb. to make a hammock. The twine comes in ½-lb. skeins and should be wound into balls to keep it from knotting before the right time. Two galvanized rings, about 2½ in. in diameter, are required.

The equipment for netting a hammock consists of a wood needle, or shuttle, a gauge board for the long meshes at the ends, and a mesh stick for the regular netting of the main body of the hammock, all of which will be described in detail.

The shuttle is made of wood and is 12 in. long, 1¼ in. wide, and ¼ in. thick. The best material to use is maple or other hard wood, but very satisfactory ones can be cut from good-grained pine. The sketch, Fig. 1, shows the general shape of the shuttle, one end being pointed and the other forked. Lay out the pointed end before beginning to cut down to size. Place a compass at the center of the end, and with a radius of 1½ in. describe the arc AB. With the intersections of this arc and the side lines of the needle, C and D, as centers, and the same radius, 1½ in., cut the arc AB at E and F. With E and F as centers draw the curves of the end of the shuttle. The reason for placing the centers outside of the shuttle lines is to obtain a longer curve to the end. The curves can be drawn free-hand, but will then not be so good.

The space across the needle at GH is divided into five ¼-in. divisions. The centers of the holes J and K at the base of the tongue are 3½ in. from the pointed end. The opening is 2¾ in. long. Bore a ¼-in. hole at the right end of the opening, and just to the left three holes, as shown by the dotted lines. With a coping saw cut out along the lines and finish with a knife, file, and sandpaper. Round off the edges, as shown by the sectional detail. It is well to bevel the curve at L so that the shuttle will wind easily. The fork is ¾ in. deep, each prong being ¼ in. wide. Slant the point of the shuttle and round off all edges throughout and sandpaper smooth.

The gauge board, Fig. 2, is used for making the long meshes at both ends of the hammock. It is a board about 3 ft. long, 4 in. wide, and 1 in. thick. An eight-penny nail is driven into the board 1 in. from the right edge and 2 in. from the end, as shown by M, allowing it to project about 1 in. and slanting a little toward the end; the other nail N will be located later.

The mesh stick, Fig. 3, should be made of maple, 8 in. long, 1¾ in. wide, and ¼ in. thick. Round off the edges and sandpaper them very smooth.

The making of the net by a specially devised shuttle is called "natting," or netting, when done with a fine thread and a suitably fine shuttle. Much may be done in unique lace-work designs, and when coarser material and larger shuttles are used, such articles as fish nets, tennis nets and hammocks may be made. The old knot used in natting was difficult to learn and there was a knack to it that was easily forgotten,

but there is a slight modification of this knot that is quite easy to learn and to make. The modified knot will be the one described.

The shuttle is first wound by looping the cord over the tongue, as shown in Fig. 4, then bringing it down to the forked end and up to the opening on the opposite side; then the cord is again looped over the tongue and returned to the fork or place of starting. Continue winding back and forth until the shuttle is full. The shuttle will accommodate from 20 to 35 complete rounds. If the shuttle is too full it crowds in passing through the meshes and delays the work.

Attach one of the galvanized rings by means of a short cord to the nail in the gauge board, as shown in Fig. 2. At a point 2 ft. from the lower edge of the ring, drive an eight-penny finishing nail, N. Tie the cord end of the shuttle to the ring, bring the shuttle down and around the nail N; then bring it back and pass it through the ring from the under side. The cord will then appear as shown. A part of the ring projects over the edge of the board to make it easier to pass the shuttle through. Draw the cord up tightly

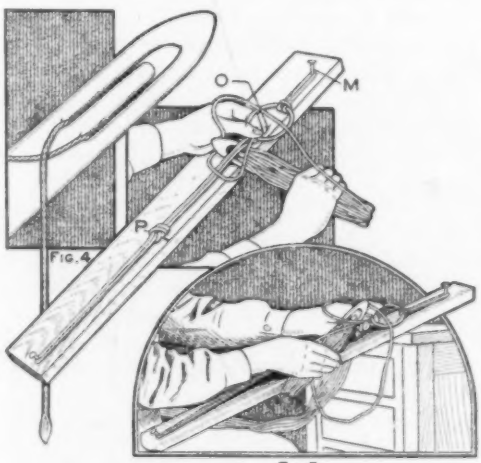
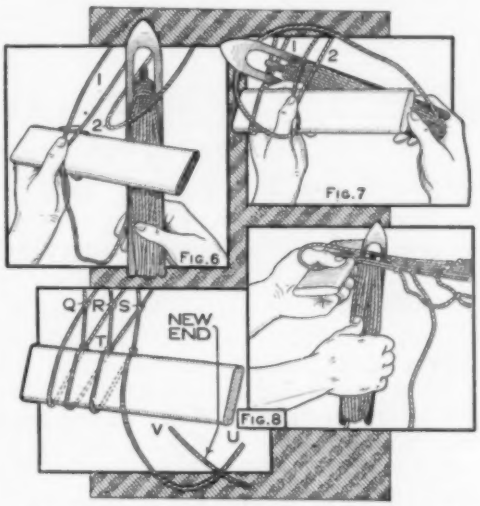



Fig. 5

**The Shuttle is First Wound and the Long Loops at One End Formed over the Gauge Stick**

and put the thumb on top of the cord O, Fig. 5, to prevent it from slipping back, then throw a loop of the cord to the left over the thumb and up over a portion of the ring and pass the shuttle under the two taut cords and bring it up between the thumb and the two




**After the Completion of the Long Meshes, the Ring is Anchored and the Mesh Stick Brought into Use**

cords, as shown. Draw the looped knot tight under the thumb. Slip the long loop off the nail N and tie a simple knot at the mark P. This last knot is tied in the long loop to prevent looseness. Proceed with the next loop as with the first and repeat until there are 30 long meshes.

After completing these meshes anchor the ring by its short cord to a hook or other stationary object. The anchorage should be a little above the level for tying the knots of the net. Tie the cord of the shuttle to the left outside loop and always work from the left to the right; and the first time across see that the long meshes do not cross over each other, but are kept in the order in which they are attached to the ring.

After tying the cord to the mesh 1, Fig. 6, bring the mesh stick into use. Pass the cord down over the mesh stick, drawing the lower end of the loop down until it comes against the upper side of the mesh stick and put the thumb down upon it in this position to prevent slipping. Pass the shut-

tle up through the loop 2 and draw that down to the mesh stick. Shift the thumb from the first position to the second. Throw the cord to the left over the thumb and about the loop 2, as shown in Fig. 7, and bring the shuttle under both of the cords of mesh 2 and up between the large backward loop and the cords of the mesh 2. Without removing the thumb draw up the knot very tight. This makes the first netting knot. Continue the cord around the mesh stick, pass it up through mesh 3, throw the backward loop, put the shuttle under and up to the left of the mesh 3 and draw very tight, and do not allow a mesh to be drawn down below the upper side of the mesh stick. Some of these cautions are practically repeated, but if a mesh is allowed to get irregular, it will give trouble in future operations.

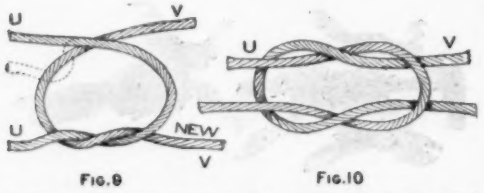


FIG. 9 FIG. 10

A Square Knot is Used to Join the Ends of the Cord When Rewinding the Shuttle

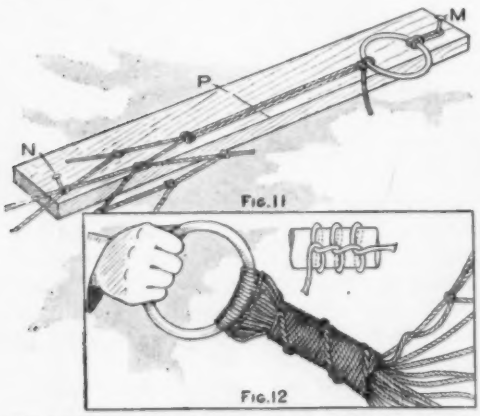


FIG. 11


FIG. 12

The Gauge Board is Again Used for the Long Loops at the Finishing End, Then the Cords are Wound

Continue across the series until all of the long loops have been used and this will bring the work to the right side. Flip the whole thing over, and the cord will be at the left, ready to begin again. Slip all the meshes off the mesh stick. It makes no difference when the meshes are taken off the stick, but they must all come off before a new row is begun. Having the ring attached to the anchorage by a cord makes it easy to flip the work over. Be sure to flip to the right and then to the left alternately to prevent the twisting, which would result if turned one way all the time.

The first mesh each time across is just a little different problem from all the others, which may be better understood by reference to Fig. 8. The knots Q, R, and S are of the next previous series. The cord is brought down over the mesh stick and up through mesh 1, and when the loop is brought down it may not draw to the mesh stick at its center; it is apt to do otherwise and a sideway pull is necessary, which is pulled so that the knots Q and R are side by side, then the knot at T may be tied. When the mesh 2 is drawn down it should pull to place without shifting, and also all the others of that row.

Continue the use of the mesh stick until a net 8 ft. long is made. When the cord gives out rewind the shuttle and tie with a small knot that will not slip. The weaver's knot is good if known, or the simple square knot shown in Fig. 9 is very good. It is too easy to make to need direction, but unless it is thrown over just right it will slip. Let U, Fig. 8, represent the short cord and V the new piece to be added. Place the cord V back of U and give U a complete turn around V, Fig. 9, and bring them together at a point above U, then to the front. Repeat the complete turn of U about V, shown by the dotted line, and pull tightly. If analyzed, it consists of two loops that are just alike and linked together as shown in Fig. 10.

When the 8 ft. of netting has been completed, proceed to make the long loops as at the beginning. The same gauge board can be used, but the tying occurs at both ends, and since the pairs cannot be knotted in the center, two

or three twists can be given by the second about the first of each pair. The long loops and the net are attached together as shown in Fig. 11. Slip one of the meshes of the last run over the nail N, and when the cord comes down from the ring, the shuttle passes through the same mesh, and when drawn up, the farthest point of the mesh comes against the nail. After this long loop has been secured at the ring, the first mesh is slipped off and the next put on. All of the long loops at this end will be about three inches shorter than at the other end, unless the finishing nail N is moved down. This will not be necessary.

With a piece of cord about six feet long, start quite close to the ring and wind all the cords of the long loops together. The winding should be made very tight, and it is best to loop under with each coil. This is shown in Fig. 12.

The hammock is now ready for use. Some like a soft, small rope run through the outside edges lengthwise, others prefer a fringe, and either can be added. The fringe can be attached about six meshes down from the upper edge of the sides. The hammock should have a stretcher at each end of the netted portion, but not as long as those required for web hammocks.

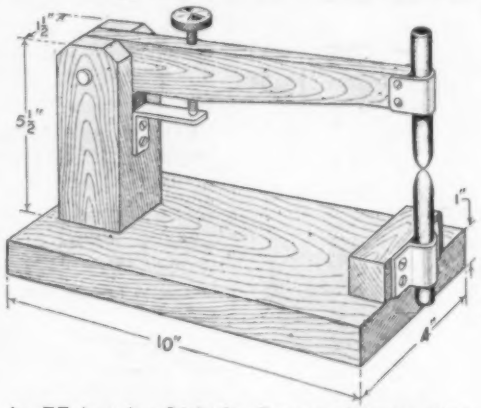
### Gourd Float for a Fishline

A unique as well as practical fishing-line float can be made of a small gourd. After the gourd has dried sufficiently, wire loops, to hold the line, are inserted, or rather, a single wire is run through and looped at both ends. The contents of the gourd need not be removed. Dip the float in a can of varnish, or apply the varnish with a brush.

### Homemade Arc Light

Those who wish to produce an arc light for experimental purposes, or for the brief periods required by photography, will find the method of construction shown in the sketch very simple and inexpensive. Using the short lengths of carbons discarded by moving-picture operators, there is no difficulty in maintaining a good arc for 15 minutes, or more, without once manipulating the adjusting screw at the top.

Only three pieces of wood are necessary besides the base, and in the preparation of these no particular care is necessary except to have the top arm swing freely up and down without any appreciable side movement. The carbon holders are merely strips of heavy tin, which need only be screwed up sufficiently tight to hold the carbons in place and yet permit their being pushed up when the top adjusting screw will no longer operate. This adjustment may be readily taken care of by means of a long, slender wood screw with the point filed off and a metal disk soldered to the top. Connections are made to the carbon holders either under a screw head or by soldering the wires to the metal.




An Efficient Arc Light for Purposes Where a Light is Required for a Short Time

In operating any arc light on the commercial 110-volt current some resistance must be placed in the circuit. An earthen jar of water with two strips of tin or lead for electrodes, will answer every purpose.

¶A small leak in an oil or water pipe on an automobile can be temporarily stopped by melting a piece of rubber over the hole.

FIG. 1

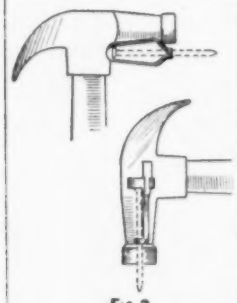


FIG. 3

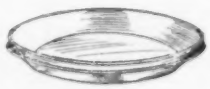


FIG. 5

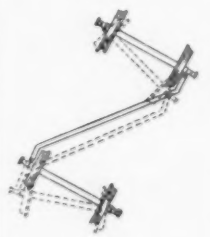


FIG. 7

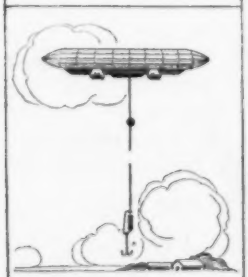


FIG. 9

## INTERESTING NEW PATENTS

**LAMP FOR LIGHTING RUNNING BOARD OF MOTOR CAR** (Fig. 1)—This device is a combination side light and light for illuminating the running board and the ground at the side of the car. The lamp is mounted in a rectangular frame of the ordinary type which is carried on the dash. By means of mirrors a portion of the light is deflected downward and to the rear through a bull's-eye at the rear of the frame.

**COMBINED WALKING STICK AND CAMERA STAND** (Fig. 2; American patent to an Englishman)—Just below the crook of the handle the stock divides into three parts, one being a rigid extension of the handle portion and the other two being hinged to it. When spread out, the walking stick forms a three-legged stand for the camera.

**HAMMERS WITH NAIL-HOLDING ATTACHMENTS** (Fig. 3)—The purpose of each of these two inventions is to provide a means for attaching the nail so that it is held securely to the hammer head while the initial blow is being struck, the attachment in each case being such that with the nail started in the wood the hammer can easily be disengaged from it. In one case the attachment consists of a two-pronged holder fixed under the sleeve and poll of the hammer head. In the other case the side of the driving head is grooved to receive the nail and the nail is held in place by a lug and spring clip mounted on the side of the poll.

**SEARCHLIGHT THAT CAN BE USED UNDER WATER** (Fig. 4)—The light is provided with a rubber cover, with glass end, which does away with the danger of short-circuiting when the light is used about or under water.

**DISH WITH DRIP RECEPTACLE** (Fig. 5; British patent)—Extending entirely around the edge is a deep groove designed to catch any drippings that may fall from the dish. The dish is evidently intended for the use of children.

**SAFETY APPLIANCE FOR SHIPS** (Fig. 6)—Collapsed inflatable bags are housed in pockets spaced around the hull just above the water line, and all these bags are connected by a pipe system with storage tanks from which they can be quickly filled with compressed air. When the air is turned into the bags the expansion of each bag automatically releases a latch that holds the hinged cover of the pocket in place, and the bag is then free to expand until it is completely inflated. The idea is to provide a sufficient number of these bags to keep the ship afloat in case the hull is punctured.

**APPARATUS FOR SWINGING BOTH AXLES OF A TRUCK** (Fig. 7)—The feature of this invention is the diagonal bar that connects one end of one axle with the opposite end of the other axle, the action of the bar being such that the axles are swung in opposite directions when the truck is being turned. Each axle is pivoted to swing on one end instead of on the center.

**WORK HOLDER** (Fig. 8)—This holder consists of two vises mounted to slide on the same base. A rod which has a right-hand thread at one end and a left-hand thread at the other passes through the vises, and the rotation of this rod causes them to be moved toward or away from each other. In a somewhat similar manner each vise can be moved transversely of the main base.

**BOMB-FIRING DEVICE FOR AIR CRAFT** (Fig. 9)—The bomb is suspended from the air craft by a cable so that it hangs a short distance above the ground, and below this hangs a double grappling hook. When the hook engages a strongly resisting object, such as a building, it actuates a trigger that explodes the bomb. The bomb can also be exploded by a weight that slides down the cable when released.

**COMBINED WEEDER AND HOE** (Fig. 10)—This implement has four tines projecting in one direction and a hoe blade projecting in the other. To change from one class of work to the other, all that is necessary is to turn the implement over.

FIG. 2

FIG. 4

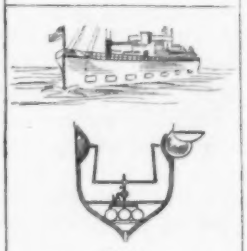


FIG. 6

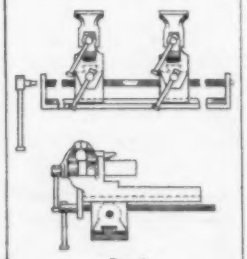


FIG. 8

FIG. 10

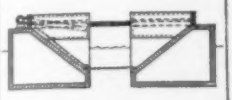


FIG. 11

**SELF-DUMPING SCOW** (Fig. 11)—This scow consists of two hulls so shaped that they form a hopper when they are drawn together. They are held in the same plane, whether drawn together or separated, by a series of sliding beams mounted on one hull and working in corresponding guideways on the other hull. The load is dumped simply by forcing the hulls apart.

**NUT DISH** (Fig. 12)—This nut dish is divided into two compartments by a vertical partition, one of the compartments being intended to hold the hulls and the unhulled nuts, and the other the meats. The upper edge of the partition is made trough-shaped to serve as a holder for the nut pick.

FIG. 12

**CONVERTIBLE MOTOR CAR** (Fig. 13)—The object of this invention is to provide a car body that can easily be made into a passenger-carrying body or a motor-truck body, as required. When used for carrying passengers, the body is of the ordinary touring-car type with two seats available for use. When it is to be converted into a truck, the front seat is first folded and lowered, and the back seat, which is mounted on pivoted arms, is swung over it. The body, which has telescoping parts, is then extended to the rear by means of a rack and pinion operated by the motor.

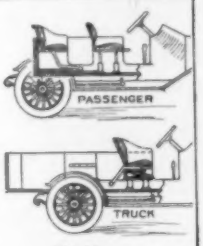



FIG. 13

**FEEDING ATTACHMENT FOR WAGON TONGUE** (Fig. 14)—Two buckets, one for each horse, are mounted on arms that are fixed to a bracket on the wagon tongue. The device is fastened together by sockets so that the buckets and arms are easily removed when not in use.

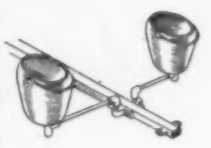


FIG. 14

**HOLDING-DOWN DEVICE FOR BOILING** (Fig. 15; British patent)—This device is designed for keeping either vegetables or clothes submerged during the boiling process. It consists simply of a vertical strip of metal formed to a circular frame in which is mounted a perforated shield made of expanded metal or woven wire. The frame is equipped with a pivoted handle.

FIG. 15

**COMBINED SQUARE AND PROTRACTOR** (Fig. 16)—The square is simply a rectangular metal frame with all sides marked with inches and fractions. On a diagonal strip is a circular arc graduated for laying off angles and marked with lines for laying off the common fractional pitches. The under side of the square is provided with a guide flange.

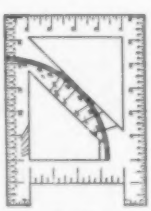


FIG. 16

**HOLDER FOR HOUSEHOLD IMPLEMENTS** (Fig. 17)—This holder is made from a single piece of wire bent to the required shape. It has eyelets so that it can be attached to the wall with nails or screws, two hooks for supporting a mop or other implement laid horizontally, and spring loops for supporting a second implement vertically.

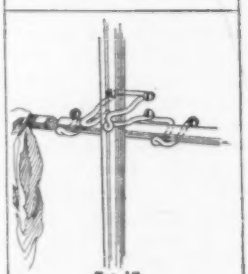


FIG. 17

**SPRING HEEL FOR SHOE** (Fig. 18)—Attached to the shoe is a hollow section in which the heel proper slides vertically, while between the bottom of the shoe and the sliding heel is a coil spring. A flange prevents the spring from thrusting the heel out of the hollow space.

FIG. 18

**POTATO DIGGER** (Fig. 19)—The implement is made of the right length to enable a workman to stand practically upright when using it. At the top of each arm is a handle and at the bottom is a head to which digging tines are attached, the tines being so shaped that they pass under the potatoes when the handles are drawn together. The arms are connected by a pivot fixed to one arm and working in a slot in the other. By working the arms longitudinally with reference to each other, the dirt is easily dislodged from the potatoes as they are lifted out of the ground.

FIG. 19

**CONVEYOR ATTACHMENT FOR CLOTHES WRINGER** (Fig. 20)—The conveyor consists of an endless belt mounted on a table and working over end rollers, as shown. The belt is operated by the wringer, one of the rollers being equipped with a gear that meshes with a gear on the wringer. As the clothes drop from the wringer they are carried forward by the belt and are deposited in a tub or other receptacle placed at the opposite side of the table.

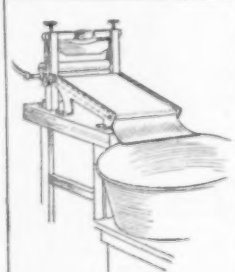
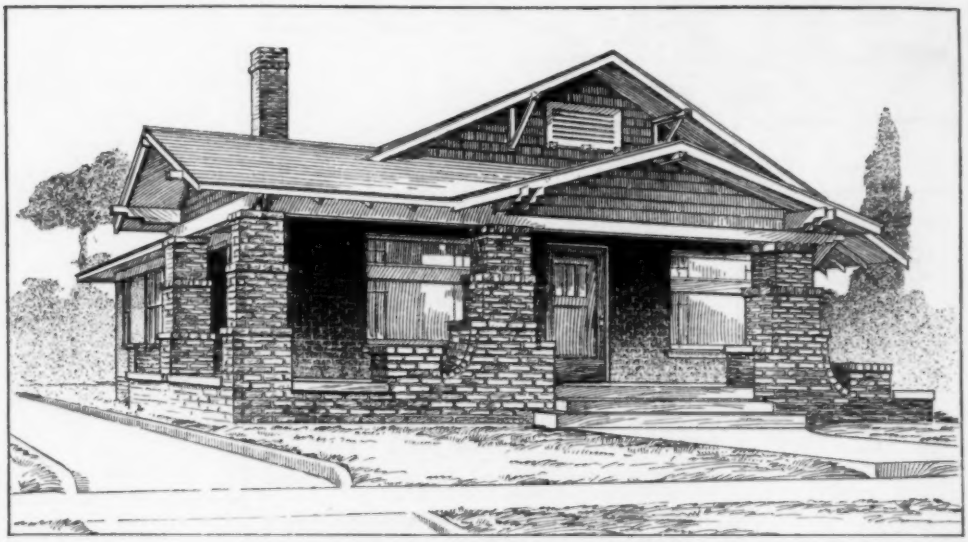
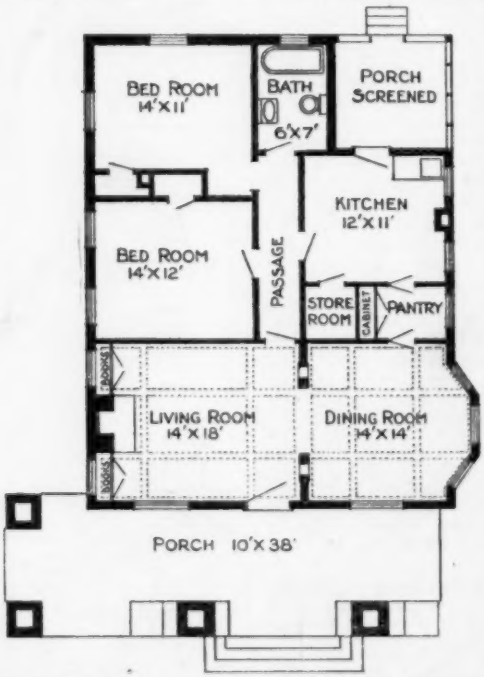


FIG. 20

# BRICK BUNGALOW ADAPTED TO WARM CLIMATE



CATES SPECIAL SERVICE, ARCHITECTS, DALLAS, TEXAS

THIS five-room brick bungalow was designed to suit the conditions that prevail in the Southwest, particularly in Texas, the idea being to provide not only a conveniently arranged house, but one that will have ample facilities for comfortable living during the southern summer. Although substantially built and carefully finished throughout, the house is within the reach of the home builder of small means, the estimated cost being $2,500, exclusive of the basement and heating plant. One of its principal features is the roomy porch extending entirely across the front, with massive rustic columns built of brick. At the rear is a screened porch evidently intended to be used as a sleeping porch. The interior is unusually well arranged. The living room and dining room occupy the entire front of the house and comprise practically one large room, being connected by a wide opening flanked by massive columns. Both of these rooms have beamed ceilings. At the sides of the brick mantel in the living room are built-in bookcases, and above each bookcase is a casement window. The dining room and kitchen are connected by a pass-pantry which is fitted with china closet and shelves. The bathroom is placed at the rear of the house, at the end of a hallway that makes it easily accessible from the living room, kitchen and two bedrooms. The kitchen is provided with a storeroom adequate for all needs, and, through the screened porch, is easily reached by tradesmen. An attractive feature of the design is the arrangement of windows in the living room and dining room by which a clear outlook is given to the front and side of the house. The arrangement of the gabled roof is not only such as to produce an attractive effect, but serves to shelter the interior from the heat of the sun by providing air spaces over practically all of the building.